STATE OF NEW YORK

REPORT

OF

ANNUAL CONFERENCE

OF

SANITARY OFFICERS

1905

From P.A. Dewey

New York State Department of Health

PROCEEDINGS

OF THE

CONFERENCE OF SANITARY OFFICERS

OF THE

STATE OF NEW YORK

Held at the Capitol, Albany, October 4, 5, 1905

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Officers of State Department of Health

1905

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The conference was called to order by Eugene H. Porter, M. D., Commissioner of State Department of Health, Wednesday, October 4, 1905, at 2.30 p. m.

Commissioner Porter:

LADIES AND GENTLEMEN OF THE CONFERENCE—The program, which you have doubtless given somewhat of observance to, will not be strictly followed at the commencement of our exercises. I am very much pleased and gratified to be able to announce that the Governor rather preferred to meet us personally in the Executive Chamber this afternoon, instead of giving us a formal speech, so that it is in order now to proceed as rapidly as possible down to the Executive Chamber, where we will be greeted by the Governor of the State of New York. (Applause.)

(The delegates then proceeded to the Executive Chamber, where they were introduced to Governor Higgins.)

Commissioner Porter—Friends of the conference, gathered together as we are to-day, engaged in the study and possible solution of those sanitary methods which are of concern to the people of the state, it is rightly a matter of congratulation to us that we find the Chief Executive of our state so earnestly and anxiously interested in this question. Earnestly, because it comes within the purview of his duty; anxiously, because everything concerning the health and welfare of the people of this state is felt to be a concern of his.

I might say to you in confidence that I had a half-formed opinion yesterday that the Governor possibly viewed with some trepidation the irruption of a body of such distinguished scientists as now confront him. But, after he has seen how harmless and inoffensive we are, and how handsome we are (laughter) I am sure he will be glad we are here.

I take great pleasure in presenting to you our distinguished fellow citizen, Hon. Frank W. Higgins, Governor of the State of New York. (Applause.)

Governor Higgins:

DOCTOR PORTER, AND THE DELEGATES ATTENDING THE SANITARY CONFERENCE—It is a great pleasure indeed for me to see you here. I am sure you will expect from me no extended remarks. Topics of public interest will come before you to solve that will require your most careful and earnest attention and thought. In your hands largely rests the health, happiness and welfare of the people of this great Empire State. Though we to-day perhaps in the field of medicine have abler physicians and better knowledge of the subject than ever before in the history of the world, and if we are sick have those to prescribe to us who are well trained for the purpose, it seems to me that the old adage grows stronger with age, that "An ounce of prevention is worth a pound of cure." The doses of prevention are in your hands to prescribe. This strong iron hand of the law should save from imprudence and danger those who are inclined to be imprudent, and should at the same time protect all.

I certainly am very glad to have you here, and very glad to have you here knowing the good work that it is possible for you to do, and I shall be glad to meet so many personally as would like to meet me. (Applause.)

(The delegates then filed past the Governor, who shook hands with them. The conference reconvened in the Assembly Chamber.)

Commissioner Porter—The next order of things on the program appears to be an address by the State Commissioner of Health. If it were possible for me to delegate this pleasant duty to some other member of the conference, I assure you I would gladly do it. But as that does not appear to be among the possibilities this afternoon, I will ask you to have the courtesy to listen to what I may find to say to you.

ADDRESS BY COMMISSIONER PORTER.

Introduction.

Perhaps you will allow me to disregard the ordinary precedent on these occasions. It may be that the opening address of this conference has commonly surveyed the present position of those questions with which your society is accustomed to deal or which it watches with interest. But, as Lord Rosebery once said, speaking as I do in the presence of many who in the various departments will discuss such subjects with ripe authority of knowledge and experience, I should feel it presumptuous in me to poise a light sentence or venture a shallow conjecture where my hearers can for themselves sound the very depth and perhaps approximate solution.

I can offer them no fresh contribution to your knowledge. I can only, as it were, set in motion my small share of electric current of sympathy and interest, which is surely not the least valuable of the features of this conference.

I will, then, if you please, attempt this afternoon to outline in some measure the present policy of the Department, to consider the various means of increasing the efficiency of our work, and the methods to be adopted in overcoming the obstacles that greed, indifference and ignorance erect against our advance. And I would do so without the slightest pretention of having anything original to advance.

Address.

Fifty years ago a conference of sanitary officers in this state or any other would have been impossible. There were no health officers in existence. The State Board of Health was unknown. Districts were comparatively thinly populated, and sanitary problems were simple and usually not pressing in character.

But as time passed and population increased, sanitary questions became rapidly more complex and demanded the highest expert skill and knowledge if proper conclusions were to be reached. The health officer of to-day is a product of the necessities of our modern civilization. He had no custom or precedent to guide him, and his sole authority is to be found in the law which created him.

It is fortunate, therefore, that there exists to-day a widespread belief among the people of the necessity and value of efficient health officers, whether local, state or national. The question is no longer shall the public health be cared for, but rather how shall it *best* be cared for?

There is no work more important than that which lies immediately before the Department of Health, of which we are all members. Among the serious and weighty questions before us are the conservation of our water supply, the checking of pollution of streams and water courses, the determination of the most satisfactory system of sewage, the investigation and ultimate prevention of tuberculosis, the abatement and extinction of epidemics of typhoid fever, scarlet fever, diphtheria and smallpox, the investigation of summer resorts, the determination and abolishment of serious nuisances and a very great betterment in the system of registration of vital statistics. There are many other questions, of course, but these are the most pressing.

It is because of the gravity and paramount importance of the questions that confront us that the existence of this conference assumes significance, and your presence here to-day in such numbers testifies unmistakably not alone your devotion to science, but your lively interest in the welfare of the people you represent and your loyalty to the Department itself. I fully recognize that you are a most vital part of the forces working for health. Through you the Department of Health exists not only at Albany, but has "a local habitation and a name" in every section of the state. I feel that I cannot too strongly impress upon you the great value of your active and cordial cooperation. To you we rightly look for accurate and trustworthy reports on existing conditions about which complaints have been received; for reports of disregard of the Public Health Law by individuals or corporations, especially the latter; for assistance in securing prompt and proper returns of vital statistics, and for needed help in many other ways. With your prompt and intelligent assistance the Department will be very greatly strengthened; without it, it would be seriously crippled. You, gentlemen of the conference, determine to a very great extent just what degree of efficiency the work of this Department shall possess.

The policy of the Department is very simple. It proposes to enforce the provisions of the Public Health Law. If an individual or corporation is illegally discharging sewage or other waste matter into any of the streams of this state to the detri-

ment of the well being of citizens residing on the banks of such streams the pollution shall be stopped; if nuisances exist threatening the health and lives of any of the people of this state, such nuisances shall be, if possible, abated; if violation of the rules established for the protection of water supplies for towns and municipalities exist, then prompt action will be taken to remedy this evil. I am confident that in those and all other matters of public concern the Department will have your earnest support.

Water Supply and Sewage Disposal.

These two closely related and important problems go hand in hand. Without a proper disposal of sewage a pure water is impossible. How to obtain abundant water pure and undefiled is the question of the hour, so far as public health is concerned. Were there no sewage discharging into any of our streams, if there were no contamination of that character, the water supply question would be much simplified. If our streams were pure we would now be wise and manage to keep them so. But for a series of years an increasing volume of sewage has been poured in our streams, until practically all are contaminated, and many of them are little better than open sewers. That the beauty and attractiveness of these streams is destroyed and is replaced by filth and repulsive odors follows as a matter of course. But these are minor evils, offensive as they are. Always with the sewage flooding down goes the stealthy and deadly typhoid. It never falters in its purpose. Patiently it waits for its opportunity to do its deadly work in some unprotected home, and the opportunity always comes. Practically all typhoid fever comes from polluted water. A small percentage, of course, comes from milk, flies and oysters. Typhoid fever is inexcusable. As has been said, it is an hygienic crime. It will not be wasted time to run over for a moment some of the results of turning our rivers into sewers. In Pittsburg, since 1900, the death rate has run from 124 to 144 per 100,000 of population. Drinking the sewage laden waters of the Alleghany and Monongahela, it has the proud distinction of being the banner city for typhoid fever. Think of the thousands of lives uselessly sacrificed and the millions of dollars vainly spent; now they are building a filter plant. Lowell and Lawrence teach an instructive and illuminating lesson. Lowell discharged its sewage into the Merrimac river. Nine miles below, Lawrence had an intake. In 1890, when Lowell's deaths were 170 per 100,000, Lawrence swelled to 134.

The next year the upstream city dropped to about 100, and the down-current settlement went to 119; while another slight reduction above resulted in a drop of 106 below. Tired of this, finally Lawrence put in a filtration plant. The rate dropped the first year to 48, and is still diminishing. Lowell also stopped using the Merrimac water, and resorted to a driven well supply, with a reduction of about 75 per cent. on typhoid cases. We hear much said about self-purification of streams. In August, 1904, the town of Mt. Savage, Maryland, had 100 cases of typhoid fever. Where the sewage of Mt. Savage discharges or reaches the Potomac is about 100 miles from Washington. Several weeks later the number of cases of typhoid in Washington jumped from two or three a day to twenty and twenty-five, and continued at that figure until the epidemic at Mt. Savage had worn itself out. Washington is building a filter now. Cleveland and Chicago gulp down their own sewage, and typhoid is master. The recent epidemic at Ithaca demonstrates the need of the establishment of rules for the protection of water supplies, and the urgent and effective enforcement of these rules.

It is not enough to establish filter plants. It diminishes the ravages of typhoid it is true, but it does not exterminate it. The best filter plant ever made has irregularity of action for various reasons, and a sufficient number of bacilli get through to continually establish new centers of infection. Since the beginning of 1905, New York state has had an enormous number of cases of typhoid fever, with 500 deaths in Greater New York alone. Is filtration enough, excellent as it results are? No, the continued pollution of our streams and lakes must stop.

It will be the fixed policy of this Department not to grant any permits for the further pollution of our streams by sewage, except for very cogent and absolutely imperative reasons.

Our summer resorts must be sharply looked after. Many of them are polluting the finest and fairest lakes and streams in our state. Many cases of typhoid are contracted by city visitors to the country during the summer. The summer hotel is often a menace not only to its own guests, but to the unhappy people who use the water it recklessly pollutes. The investigation of these places, and a full report of existing conditions to the Department, is a duty that seems to fairly belong to the local health officer. I propose to begin a systematic investigation of the condition of our summer resorts, and hope to lessen the danger of typhoid.

But to do all this work of examining into the conditions of our streams, of investigating thoroughly all new sewage systems, of improving the condition of our summer resorts, I have the magnificent sum of three thousand dollars ($3,000), and out of that I must pay the expenses of this conference. Massachusetts has for years appropriated thirty thousand dollars ($30,000) for the protection of her water supply alone.

Consumption.

The great White plague. It is a somewhat singular fact that so far the desperate battle with tuberculosis has been marked by private energy and enthusiasm, and by official apathy and apparent indifference. Of course, there are exceptions to this rule. Some health boards have done valuable work, and the number of these is increasing. The experience and knowledge of recent years have taught us how to meet and conquer the great plague. Sunlight, open air, cleanliness, pure diet, judicious exercise, comfortable and cheerful surroundings—these are the weapons that win victories in the struggle for life and health. Every civilized country now has organizations for the study and investigation of consumption. What we need in this country most just now is a campaign of education, and this must be thorough and extensive enough to educate the public, the profession and the patient. The public is already partially informed, but needs more light; the patient is now generally well posted, but, strange to say, the medical profession lags behind. It is true, in New York you may find special dispensaries for tuberculosis with nurses and medicine, together with night classes for instruction how to fight the battle for life. Boston has committees of investigation, with nurses, ample aid and proper medicine. Besides these aids, Chicago is making a map of all infected houses, and right there is the rub. We must know where the danger is if we are to hope to fight it successfully. Consumption is essentially a house disease. To conquer it we must locate it. In order to do this cases must be reported. There need be no publicity about this, nor should anything result from it disagreeable or offensive to intelligent people. The patient's chief desire is to get well, and our great aim is to help him do so. A complete system of registration of tuberculosis cases in the state would enable us to locate all infected centers, to determine accurately the present status of the disease, and to be able to fix its increase or decrease, and we could then send help where

it was most needed, disinfect or destroy dangerous dwellings, and eventually be enabled to establish sanitaria where most desirable. No more stigma should attach to the reporting of a case of tuberculosis than of typhoid fever. In the case of typhoid the report is made for the public good mainly; in the case of tuberculosis it would be made as much for the good of the patient as for the public. You will remember that in 1782, Naples had a law requiring the registration of consumptive cases. For not complying with the law for the first offense the fine was 300 ducats; for the second, banishment for ten years. It is said that all cases were reported.

To educate the people lectures should be given fully illustrated; pamphlets of explicit instructions sent to infected families, special talks in public schools by competent men and women, and finally by enlisting the aid of the editorial writers for the press.

The Department intends to undertake some of this work—all of it if possible—at the earliest possible moment, and it looks to you for needed help. But it regards registration of cases as vital.

Vital Statistics.

This important work of the Department is still imperfect, owing to the failure of many physicians to report cases, and the indolent neglect of the town clerk to forward returns. It will probably be necessary in some cases to proceed against delinquents to the full extent of the law.

Conferences.

It has been suggested that the annual conference be held in different parts of the state, and not always in Albany. If, for example, it were held at Syracuse, Rochester, Buffalo and Albany, opportunity would be better afforded for all health officers to attend some of the meetings. I would like to know what you think about this proposition.

Sanitary Institutes.

It is the purpose and desire of the Department to hold in the chief towns of the state sanitary institutes, for health officials and physicians generally. At these meetings the duties of health officers and health boards would be considered; the Public Health Law would be explained; methods of disinfection would be stated and illustrated; systems of filtration for water would be

discussed; the modern plans for sewage disposal would be fully explained; the work of the Department would be gone over and many other important matters receive attention. It is thought that a series of meetings of this kind would do much to assure interest in our work.

Pure Foods.

It is undoubtedly the duty of this Department, if sufficient appropriation of funds is made by the state, to see that all articles of food offered for sale in this state shall be free from adulteration, and shall contain no ingredients dangerous to the public health.

There has been much irresponsible and unintelligent clamor about the adulteration of prepared foods. Mere assertion is not fact, and the reiteration of a false assertion does not even afford a basis for argument, however much it may deceive the unwary.

Giving to this question the careful consideration that matters of importance demand from the prudent, I think we will all agree that, while recognizing the existence of gross misstatements, there are at the present time many foods offered for sale that are adulterated, some of which are injurious to the health of those who use them. While I desire to be moderate in statement as to the present status of adulteration of foods, I wish to be clear and emphatic in my opinion that the more dangerous and deceptive forms of adulteration now known or strongly suspected to exist, should be at once proceeded against to the full extent of the law. If flour, butter, milk, syrup and molasses, coffee, tea or oils are injuriously adulterated; if so-called "food preparations" are used to the damage of the consumer, it is certainly time that something was done to prevent such practices. In this connection I am glad to note the recent decision of the Commissioner of Internal Revenue, that the manufacturers of patent medicines composed largely of distilled liquors must take out licenses as rectifiers and liquor dealers, and that druggists and others handling them will have to pay the usual retail liquor dealer's license. This is a great step in the direction of pure drugs.

As to what is to be done, I may say that I propose, if funds are granted, to do the duty lying right ahead, and stop as many dangerous adulterations of foods as promptly as possible.

I agree with Professor Tucker in his admirable paper read before this conference in 1902, that specific prohibition by law

of certain articles would be unwise, and is productive of no permanent advantage. If, as he then suggested, we could have a law based upon the English statute "Empowering the Department to establish standards, fix limits for variability, declare what article shall be exempt from the provisions of the law, and make such regulations and declarations as shall seem necessary to enforce or facilitate enforcement of the law," it would be a long step in the right direction. It should also be ordered, as Professor Tucker suggested, "that in the case of every food article, in the preparation of which preservatives other than certain articles such as sugar or salt are employed, the fact of such employment and the quantity used shall be plainly stated upon the package."

It seems to me that we should not rely upon the National government for food regulation, but that each state must legislate for itself. In accordance with that opinion the Department will endeavor to present to you next year a pure food law as wise and comprehensive as expert advice and aid can make it.

Investment for Public Health.

In conclusion, the problems before us are often in the main mostly those of education. The end of a century means a change in human affairs only because men so regard it. And with the Twentieth century came also in power and beauty a new ideal. We demand life for ourselves and for every human being. As Professor Griggs has so justly and eloquently said, "The progress of civilization consists chiefly in the accumulation of the material of life, and in the earlier and better initiation of the individual through education into the experience of the race, that he may take and use his inheritance from the past. The objective progress we are able to see in history lies almost entirely in the increase in this material and the skill to use it effectually." To be educated as well as the men of some past epoch, is to be insufficiently trained for the needs of to-day.

To carry out the plans and aspirations of this conference, there must be a campaign of education systematically and persistently carried on. Back of us are the important measures upon which we have set our hearts, and which we believe mean so much for the health and happiness of the people of our great state. Before us are entrenched all the forces of selfishness, prejudice and ignorance. Let us not fear strife. Let us fight for our ideals, but

make sure our methods are practical. Let us educate our fellow citizens to the great importance of the battle we are waging; educate our legislators so that they may see that an investment for public health for the State of New York is the crying need for the home. Let us fight by educating our fellow men, not so much perhaps as to our objects, for in that many are clear already, but as to the proper means of obtaining these objects. And if you believe that your Department is thoroughly in earnest in these matters, and you believe it right in its position, you will give us your support.

Commissioner Porter—You know, my friends, that the members of this conference—I except a few of those I see before me—do not hold themselves out as orators, as swayers of the multitudes, as possessed of silver tongues of eloquence, and when we want something of that kind, and we want it very often, we have to go outside our ranks. When you can find a speaker who waxes eloquent and at the same time exercises wisdom, who is in the fore front of public attention, you have found a man who is so often sought for yet not found. It therefore gives me the greatest pleasure to present the next speaker to you, a man whose knowledge of law is only equaled by his exposition of it; a man whose fame reaches from Montauk Point to Buffalo, who has agreed to be here simply because he said he wanted the pleasure of looking into the faces of so many eminent physicians.

It gives me great pleasure to present the Hon. Julius M. Mayer, Attorney-General of the State of New York. (Applause.)

ADDRESS BY HON. JULIUS M. MAYER,

Attorney-General, State of New York.

MR. PRESIDENT, LADIES AND GENTLEMEN—Doctor Porter, who is presiding over your conference, and I have occasion during the winter time to attend some functions, public and private, and it has been my good fortune heretofore to speak before anybody had an opportunity to hear him. I have had occasion to say two or three playful things about him, and I knew the day of reckoning would come. It is here to-day because in what he conceives to be a humorous introduction he has made you think I am really the kind of person he described.

I have come here to-day for the pleasure of meeting a conference engaged in so important a work. The doctor put me upon the program and then wrote me a letter telling me I was on the program, and I regret to say that other duties have been so pressing that I have not done that necessary thing, which I understand is always required at a conference, to write and deliver a paper. I possibly couldn't if I tried, so what I shall have to say will be in the way of a few disconnected remarks on some subjects that perhaps have a close relation to the law department of the state government.

However wise a law may be, unless it is capable of enforcement the wisdom of the law is of no value. Looking at it from the lawyer's point of view, there has been very marked progress along the lines of appreciation by the courts of the necessity of quick action and of efficient administration of laws relating to the public health. I think it is quite important that the administrative officers charged with the duty of executing the law, should know something of the principles underlying that execution; and that official of course is most valuable and efficient who has at least sufficient knowledge of the law to make his work practical.

Not long since the Supreme Court of the United States decided a case which in my judgment makes much for the advance of the modern method of administration; a case which is important not because it justified the vaccination of a patient, a subject concerning which I presume there has been much discussion, but a case important because it upheld the power to put into operation any method to check or alleviate disease which in the best judgment of

the lawmakers was the method to be adopted. I am going to ask you to be patient for a moment or two while I read just a few lines from the opinion of Mr. Justice Harlan, of the Supreme Court of the United States, in the now famous case of Jacobson v. Massachusetts, reported in 197 U. S., and this particular quotation beginning at page 25; the purpose of this citation being to show what the courts regard as the present relation between the individual and the state when there is concern as to the execution of a law that has to do with the public health. He says:

"According to settled principles the police power of a state must be held to embrace, at least, such reasonable regulations established directly by legislative enactment as will protect the public health and the public safety. It is equally true that the state may invest local bodies called into existence for purposes of local administration with authority in some appropriate way to safeguard the public health and the public safety. The mode or manner in which those results are to be accomplished is within the discretion of the state, subject, of course, so far as Federal power is concerned, only to the condition that no rule prescribed by a state, nor any regulation adopted by a local governmental agency acting under the sanction of state legislation, shall contravene the Constitution of the United States or infringe any right granted or secured by that instrument. We come, then, to inquire whether any right given, or secured by the Constitution, is invaded by the statute as interpreted by the state court"—the statute being the statute relating to vaccination in the State of Massachusetts. "The defendant insists that his liberty is invaded when the state subjects him to fine or imprisonment for neglecting or refusing to submit to vaccination; that a compulsory vaccination law is unreasonable, arbitrary and oppressive and, therefore, hostile to the inherent right of every free man to care for his own body and health in such way as to him seems best; and that the execution of such a law against one who objects to vaccination, no matter for what reason, is nothing short of an assault upon his person. But the liberty secured by the Constitution of the United States to every person within its jurisdiction does not import an absolute right in each person to be, at all times and in all circumstances, wholly free from restraint. There are manifold restraints to which every person is necessarily subject for the common good. On any other basis organized society could not exist with safety to its members. Society based on the rule that each one is a law unto himself

would soon be confronted with disorder and anarchy. Real liberty for all could not exist under the operation of a principle which recognizes the right of each individual person to use his own, whether in respect of his person or his property, regardless of the injury that may be done to others. This court has more than once recognized it as a fundamental principle that 'persons and property are subjected to all kinds of restraints and burdens, in order to secure the general comfort, health, and prosperity of the state; of the perfect right of the legislature to do which no question ever was, or upon acknowledged general principles ever can be made, so far as natural persons are concerned,' and continuing that reasoning the Supreme Court of the United States upheld the courts of the State of Massachusetts in construing as constitutional this mandatory statute as to vaccination."

Now that has marked a very important point in the road forward for the administration and execution of laws relating to public health. The American people, of course, are jealous of individual rights. It was upon that proposition that republic was founded and is continuing, but yet the complexity of modern civilization, with our population increasing, with new problems presenting themselves, it was important that we should have a declaration from the highest court in the land that when the subject matter is one of public health the view, notion, theory or the comfort of the individual must yield to the safety of the people at large.

And our own Court of Appeals, just before this decision was announced, had held the same proposition in the case of Matter of Viemeister, reported in 179 N. Y. In the Borough of Queens, city of New York, resistance was made by a citizen to the exercise of this power by the local board of health.

Now remembering that underlying principle, we nevertheless find that there are many difficulties in the way of carrying out the theories as to public health. You gentlemen may determine, and your determination may be the will of the legislature, that this or that extraordinary method is needed; yet that method may not be put into operation unless it is strictly in accordance with law. But the tendency being as I have stated, and as you will note from this quotation, to make the individual yield for the public good, there is coming into your hands year after year greater power as health officers. You are to have greater judgment—I might better say greater latitude of judgment to put quickly into practice or operation what you may deem to be the

needed remedy to meet the situation. Now as you give administrative officers greater power, you must always be cautious that that power is exercised with judgment and tact and discretion. The health officer brings about him the public sentiment of a community best who is most tactful, while at the same time being firm in carrying out the orders that he and his associates deem proper. If it be not inappropriate for one who is not of you to make a suggestion, I would say that as this power increases which is given to you or to be given to you in the public good, so should you be all the more cautious to use that power in a way to command the good will and sentiment of the best citizens in the neighborhood in which you live. That power will not be regarded as arbitrary if you assume the duty, not by saying that this is what you are going to do and you don't care who likes it, but rather assuming the duty and explaining why you are going to do it, and then go on and do it and stay by until it is done.

Now there are some provisions about the present Public Health Law which I think should be called to your attention.

Section 5, as you will recall, provides for a record of births, deaths and marriages, and is an exceedingly important section, not alone from the standpoint of public health, but in the relation of citizens to each other. It becomes important in contests over property, in the search for lost heirs, in many other business relations, to have an appropriate record of deaths, births and marriages. The keeping of that record is not merely for statistical purposes, nor is it merely for scientific purposes, so that upon the record you may predicate certain conclusions, but it is as I said, and I desire to impress upon you, important as having a close relation to the relations of property and business of the citizens of the state. Now as I am told that branch of the law is not lived up to with that care which it deserves, and I have only suggested the importance of it so that every one who may be here may in his turn impress it upon all the officials who are charged with a duty in connection with section 5. I have been informed, I don't know how correctly, that some denominations or persons belonging to some religious faiths or congregations are somewhat unfriendly to that section. If that information be correct, I think that their views would be changed if they knew the great importance of this little provision of law.

There is another provision of law to which I would call the attention of the health officers from the villages and other communities of the state. That is section 20, providing for the fill-

ing of vacancies. Now you will remember that section provides that if the proper authorities shall not fill any vacancies occurring in the membership of a local board within thirty days after the happening of such vacancy, the county judge of the county shall appoint a competent person to fill the vacancy for the unexpired term. That provision of the enactment was held to be unconstitutional by the Court of Appeals of this state in a case which came up from the city of Oswego, entitled the People of the State on the relation of Bouton against Houghton. The Constitution, article 10, section 2, provides, "All city, town and village officers, whose election or appointment is not provided for by this Constitution, shall be elected by the electors of such cities, towns and villages, or of some division thereof, or appointed by such authorities thereof, as the legislature shall designate for that purpose," and the court held that a county judge was not such a local authority as the legislature should have designated for the purpose of filling vacancies.

Now I call this to your attention because frequently you may be in a position where such a case may arise, and I want you to understand that this cannot be done. Some situation may arise in some community where a health officer may be improperly appointed and a great deal of difficulty follow such appointment.

Section 24, as you know, relates to reports by local boards to the State Board. So far as I am individually concerned, with such little observation as I have had since I have been here, I am a great believer in a state board to supervise work of this character and of a similar character. It is the only way that you get unity of action, the only way in which you get orderly system. The health officers in many of the communities, as we know, are volunteers. They are performing a patriotic service out of their desire to be useful to their community. It is most important that they should keep in the closest kind of touch with the State Commissioner, in order that they may get the benefit of his closer touch with the whole state and of his wider experience; and I think that it might be a proper suggestion to make that the state law should be so amended as to provide for a compulsory annual report of the general situation in villages and other communities to the State Commissioner, and that report should be on file in the office of the State Commissioner so that when necessary he can put his finger upon the situation in the same way he can put his finger upon the button in his office which calls one of his employees.

Now I have one or two suggestions to make in regard to the importance of health provisions, but perhaps before I refer to them specifically I might say something that occurred to me when I heard the Commissioner speak about the adulteration of foods.

Of course the Health Department, or any health department or health officer, is closely related to other departments. The Department of Agriculture, as you know, has to do with the enforcement of many laws which relate to public health, excepting in particular localities in regard to particular local ordinances. The Agricultural Department prosecutes cases involving the adulteration of milk and the adulteration of food. These prosecutions are conducted by the Attorney-General or his assistants. That therefore really establishes a relation between the Health Department and the Agricultural Department upon a subject upon which they should be moving to a common end. I have no doubt that there will be a relation between the Health Department and the new State Water Supply Commission, and I am going to ask you to let me read to you just one or two of the duties of this new Water Supply Commission, which was established under chapter 723 of the Laws of 1905. Now in addition to the powers and duties that are referred to earlier in the act, and which are not important for the purposes of this discussion, the said commission " shall immediately after its appointment, proceed to make an investigation and report to the legislature as part of its first annual report hereinafter provided for, concerning the available sources of water supply in this state, the respective purity and quantity of each source of supply and the availability of each to be used for localities other than those immediately adjacent thereto."

Then skipping a paragraph, " said commission shall also report the present dispositions of sewerage of each municipal corporation and other civil divisions of the state, and if necessary, of adjoining states, with special reference to said disposition affecting the various municipal corporations and other civil divisions of the state in relation to the water supply of this state. Said commission shall also report the advisability of, the time required for and the expenses incident to, the construction of a state system of water supply and for a state system for the disposition of sewerage, if necessary, for all or any of the municipal corporations," and so forth.

My only purpose in reading that extract from the new law is to

show that that commission will have a close relation to the question of public health, and that every health officer ought to be advised of the duties of the commission so that he may make such suggestions in the matter as may be proper. When I say that I am presenting only my own views. I am not presenting the views of the commission, because I am gathering these views entirely from the statute as I read it.

Now I wish to say a word about the enforcement of the law, because I wanted to point this to you. It has been a great struggle to enforce the law relating to pure milk and to pure foods, but great progress has been made in that struggle. It was first supposed that it was necessary in the courts to show that the person intended to adulterate the milk. Well, now, how much experience you have had in courts on these subjects I don't know, but at least every man here has had sufficient experience to know that it is impossible to show in any case, unless you catch a man red handed, that he had the intention to adulterate the milk. When you have milk upon your table how are you going to prove that a particular man, John Brown or Peter Smith, who sold you that milk, adulterated that milk? And so after a good deal of a struggle in the courts this doctrine is now established; that the law makes a standard for milk, and says the milk must contain such and such percentage of ingredients in order to be a standard of milk; if it doesn't contain them, then it is an adulterated milk, and the courts now hold that all you need do is to show that the milk was sold, and in certain jurisdictions was merely possessed, and you have established your case against the man who has sold you that milk.

Now we must come sooner or later to that same principle in regard to adulterated food. Without statutes framed along the same lines as the milk statutes you never can get anywhere near as far as you ought to in the prevention of the adulteration of food. I am sure a great advance has already been made.

Now I appreciated and learned something here that I did not know before. I can readily see how it is very much more desirable, if it can be done, that elasticity should be given to administrative officers, so that as new developments come month after month and day after day, instead of year after year we may make certain standards for food, and if that power is given to you then it needs to be supplemented by an enactment or series of enactments whereby the mere possession or sale of food that does

not reach that standard will be either a misdemeanor or subject the person who offends against the law to a money penalty, or both.

Now one more suggestion in regard to the enforcement of the law. In the recent statute which created the State Gas Commission, a provision was inserted which in principle I think will be very valuable if a similar provision can be applied to the enforcement of the Health Law. Of course as it is now you have various methods of enforcing the law. Under certain circumstances a failure to abide by the rules and regulations or ordinances constitutes a misdemeanor. That is a very valuable aid to the law at times, and yet it is not always efficient. Under other circumstances persons render themselves liable to a penalty. That is likewise valuable at times, but not always efficient. When you are really abreast of a real fight, and there is some powerful interest that is resisting the execution of your mandate, then is the time you want a law that will be really efficient. Now your order, assuming as we must that it is carefully considered, should be obeyed. If you make the kind of orders that are not right, the remedy of course is always quick, because the people will repudiate you. There has been put into the present Gas Commission Law this provision:

"An order made by the commission, as in this act provided, or in case of an appeal from an order, the order as affirmed or modified or the order made on such appeal may be enforced by a writ of mandamus. The commission or any person, corporation or municipality interested in the enforcement of such orders may apply to the Supreme Court at a special term thereof for a writ of mandamus to compel compliance with such order upon proof that the said order has been duly made, as in this act provided, and has not been complied with, after notice of the making thereof, to the person or corporation affected thereby, the Supreme Court may issue a writ of mandamus to enforce the provisions of said order."

And the penalty for failure to abide by a writ of the Supreme Court in this state is punishment for contempt of court.

Now I believe that that remedy could be added efficiently to existing remedies for the carrying out of the health laws of the state.

I sincerely hope I have not been too technical. When I sit and listen to physicians, they usually talk about things I don't know and never expect to know. I have tried to be as little technical,

to use as little strictly legal language as possible. I have kept my word with you that all I should say would be a few disconnected things which have occurred to me in the administration of my office, and I can only say in conclusion that I would regard it as no greater duty, I can think of no greater duty than the duty of lending the law arm of the state to the enforcement of health laws, and that if it comes to my department at any time to sustain the legitimate power of the state in enforcing the various health laws, my department will give to it all of the earnestness, all of the labor, and all of the thought of which it is capable. (Applause.)

Commissioner Porter—I am sure we all thank the judge for his able and instructive address, and I am very glad to announce to you that while I put the judge's name on first and notified him afterwards, there was another distinguished gentleman whose name is not on the program, because the program was sent to the printer before I was aware of it. I am very happy to say that we have with us this afternoon the Corporation Counsel of the City of Albany, a gentleman who has given not only a great degree of study to this question, but who has had an unusually wide experience. I am very much pleased to introduce to you the Honorable Arthur L. Andrews, who will now address you. (Applause.)

ADDRESS BY HON. ARTHUR L. ANDREWS,

Corporation Counsel of Albany.

Mr. Chairman and Gentlemen—I am not at all sorry that my name did not appear upon the printed programme. In fact, if I were permitted to follow the dictates of my own wishes I should ask leave to print now rather than to weary you by what I am afraid may not be particularly interesting. I am not here so much because I claim to be an authority upon these matters, or to have anything that is particularly original to say on the subject about which I am to speak, but rather as an indication of my good will and my interest in the public health laws of the state and the desire which I have to encourage health officials, as far as I can, in the discharge of a very important duty to the public.

The subject which I have selected was suggested to me by the gentleman who did me the honor to ask me to speak here this forenoon. It has already been alluded to. It is as I think one of the questions which is of growing importance and which at any time may be of the greatest importance to any particular locality. It is the subject of compulsory vaccination.

"Compulsory Vaccination."

The prevalence during the past two or three winters of an unusual number of cases of smallpox, amounting in some localities to an epidemic, has called the subject of vaccination to public attention, and has led to considerable discussion in the newspapers and elsewhere, not only as to its efficacy but as to the right, legal and moral, to pass and enforce laws and regulations compelling persons to submit to it.

It is not my province to discuss vaccination from a medical standpoint. There are certain learned men in the medical profession who not only deny that vaccination is a preventive of smallpox, but also allege that in some instances at least it is attended with evil results and does incalculable harm. Cases are cited where such results have occurred and afford a basis for an honest difference of opinion among the members of the medical profession and among the people generally.

The legislature in its wisdom, however, has seen fit to make

certain enactments respecting the subject and placed them in the Public Health Law. Whether this constituted a wise and judicious exercise of legislative power is not a question which should be raised by those charged with the duty of enforcing the health laws of the state. As a general proposition, administrative officers ought to administer the law as they find it. It is their sworn duty so to do. To allow public officers charged with the enforcement of laws to pass upon the wisdom of legislation, to substitute their judgment for that of the legislative body and then to enforce or not enforce the law, as they may see fit, would produce a state of chaos and work immeasurable evil.

The best way to demonstrate that a bad law is bad is to enforce it. Once its badness is revealed its repeal will be demanded and secured, or its evil features eliminated by proper amendment. On the other hand, the failure to enforce law engenders this respect for all law, and in the end for all constituted authorities.

I do not intend by these remarks to be understood as questioning the wisdom of compulsory vaccination. I think the weight of authorities is in its favor. I am arguing against a tendency in public officers to assume the right to determine whether they will or will not enforce the law. This I am convinced is wrong in theory, pernicious in practice and in the end will lead to disastrous results.

The law relating to vaccination is found in sections 210 and 211 of the Public Health Law.

That law provides as follows:

"No child or person not vaccinated shall be admitted or received into any of the public schools of the state and the trustees or other officers having the charge, management or control of such schools shall cause this provision of law to be enforced. They may adopt a resolution excluding such children and persons not vaccinated from such schools until vaccinated."

The same law provides for the free vaccination of children of suitable age who shall wish to attend the pubic schools, provided their parent or guardian is unable to procure vaccination for them.

Section 24 of the Public Health Law makes it the duty of local health boards to provide at stated intervals a suitable supply of vaccine virus of a quality and from a source approved by the State Department of Health, and during an actual epidemic of smallpox to obtain fresh supplies of such virus and at all times pro-

vide thorough and safe vaccination for all persons in need of the same.

The law for the compulsory vaccination of school children is substantially a reenactment of the statute containing a similar provision passed in 1860 (Laws 1860, chapter 438), and has therefore been the law of this state for more than 45 years.

Perhaps owing to the laxity with which compliance with its provisions has been enforced, for it is a well known fact that until a few years past, health laws have been regarded as rules and regulations to be enforced only on extraordinary occasions, when epidemics of disease have frightened the public into a demand for protection, perhaps owing to the fact that when questioned, health officers have yielded rather than test their powers in legal proceedings, the power of the legislature to pass such legislation, and the authority conferred thereby was not presented to any court, so far as I have been able to ascertain, until the year 1903. At that time a boy ten years of age, who had been in regular attendance at a public school in Queens county, was excluded therefrom by the principal pursuant to the instructions of the board of education because he refused to be vaccinated.

It appeared that the lad had never been vaccinated, but it did not appear that at the time he was excluded from school there was any smallpox prevalent in the vicinity, or that he had been exposed to the disease, or that there were any special circumstances giving rise to danger from contagion. Purely as a precautionary measure, the school board had adopted the rule forbidding the attendance of any pupil in the public schools who had not been vaccinated.

The question was thus squarely presented to the court as to the power of the legislature to pass laws of this kind and to provide for their enforcement.

The law was attacked upon the ground that it was an invasion of rights secured by the Constitution of the state and thereby void.

The three constitutional provisions which it was claimed had been violated were:

1. Article 9, section 1, which requires the legislature to "provide for the maintenance and support of a system of free common schools wherein all the children of this state may be educated."

2. Article 1, sections 1 and 6, which in substance secure to all persons equal rights and privileges, and prohibit any action by

which any person shall be deprived of life, liberty or property without due process of law.

It was not denied that the legislature had power to make certain rules and regulations governing the admission of pupils to public schools, but it was urged that the requirement for vaccination was an unreasonable restriction upon the right of the child to attend school, and that inasmuch as the efficacy of vaccination as a preventive of smallpox was disputed, it was the right of the pupil or his parent or guardian to determine whether it was advisable or not.

The law was sustained by all the courts, the final decision being handed down by the Court of Appeals, October 18, 1904. The case is reported in vol. 179, p. 235, N. Y. Reports.

Thus all legal objections to this law have been overruled and it stands until changed by the legislature.

In the opinion of Vann, J., he alluded to the divergent views respecting the efficacy of vaccination and holds, the other judges concurring, that it is the common belief, accepted by the mass of the people and by most members of the medical profession, that vaccination has a decided tendency to prevent the spread of this fearful disease, and to render it less dangerous to those who contract it, and that the legislature by virtue of the police power of the sovereign state, which may be exercised to promote public health and safety, was authorized to enact the law in question.

General vaccination is compulsory in but few states of this country, but it is countenanced or promoted in substantially all, and wherever statutes requiring children to be vaccinated in order to attend the public schools have been assailed in the courts, they have been universally sustained.

Thus the highest courts in California, Connecticut, Georgia, Indiana, Missouri, North Carolina, Pennsylvania and Vermont have all passed upon and sustained laws similar to the one in this state.

Primarily the duty of enforcing this law rests upon school trustees or boards of education. I do not understand, however, that relieves health officers and health boards from responsibility for its enforcement. In my judgment it is an unwise provision. The exercise of all powers and duties appertaining to the public health ought to rest with the health officials. Division of power leads to division of responsibility; division of responsibility leads to laxity in the administration of government. It is a correct

principle of government to bestow power upon the individual and then hold him responsible for its exercise.

Investigation will show conclusively that those localities which have a single officer charged with the duty of looking after the public health are much better served than those where there is a division of power and therefore the opportunity to pass responsibility for the failure to properly discharge duty from one officer to another.

So long as the law remains as it is health officers should see to it that school trustees and boards of education do their duty.

As I have already stated, laws requiring compulsory vaccination in this country have, so far as the precise terms of those laws are concerned, been confined to pupils in the public schools, though inferentially and by implication vaccination may be required in other cases, as I shall attempt to show later on.

In Europe general compulsory vaccination has been the law for many years, and it is required in nearly all the armies and navies of the world.

In 1854, England passed laws requiring and regulating the vaccination of all its citizens. The last act upon the subject, passed in 1898, requires any child born in England to be vaccinated within six months of its birth. In Bavaria vaccination became compulsory as early as 1807; in Denmark, in 1810; in Seden, 1814; Wurtemburg, Hesse and other German states, 1818; Prussia, 1835; Roumania, 1874; Hungary, 1876, and Servia, 1881. In other European countries there are laws upon the subject, though they are not general in their application.

In this country we have been slow to adopt such measures. Our boasted liberty of thought and action is a priceless boon, but sometimes proves a hindrance to the progress of reforms, which other countries with less liberty and more concentration of authority speedily adopt.

That the health officials in this state have some power with respect to compulsory vaccination seems to me to be fairly inferred from the language of section 24 of the Public Health Law.

This section provides, " Such local boards of health shall guard against the introduction of contagious and infectious diseases by the exercise of proper and vigilant medical inspection, and control of all persons and things arriving in the municipality from infected places or which from any cause are liable to communicate contagion. It shall require the isolation of all persons and things infected with or exposed to such diseases and provide suitable

places for the treatment and care of sick persons who cannot otherwise be provided for. It shall prohibit and prevent all intercourse and communication with or use of infected premises, places or things, and require, and if necessary, provide the means for the thorough purification and cleansing of the same before general intercourse with the same or use thereof shall be allowed."

The right to establish and maintain quarantine under this provision is recognized and undisputed. Some control over the movements of persons who have been exposed to contagion is given, but it is not clear how far the officials may go in requiring vaccination.

Persons afflicted with the smallpox may be excluded from the locality. Those already there who have the disease may be removed to pest houses or hospitals or quarantined in their own homes.

That the law does not permit of a rule or regulation requiring universal vaccination is well settled by the highest court of the state.

In the Matter of Smith, reported in vol. 146 N. Y. Reports, p. 68, decided May, 1895, the power of a health officer to order a person to be vaccinated was considered, and it was there held that the public health law did not authorize the enforcement of a rule requiring vaccination where no special circumstances were shown to exist which required such a rule.

In that case the mayor of Brooklyn and the president of a medical society of the county of Kings had issued a proclamation that great and imminent peril existed by reason of the discovery of 28 cases of smallpox in and about the seventeenth ward of the city.

The commissioner of health thereupon determined that in order to preserve the public health from the impending pestilence of smallpox it was necessary to promulgate and enforce the following regulations:

1st. Thorough and sufficient vaccination of every person who has not been successfully vaccinated within such period of time as in the judgment of the commissioner of health renders such person immune should be procured.

2nd. Whenever any person in said city shall refuse to be vaccinated such person shall be immediately quarantined and detained in quarantine until he consents to such vaccination.

Two men, Smith, who was the proprietor of an express delivery

business, and Cummings, who was employed by him in said business, were both actively engaged in the prosecution thereof in the cities of New York and Brooklyn, and especially Greenpoint and the eastern district of Brooklyn, which latter had been one of the worst infected centers of said city. Their business included the carrying of trunks, bedding, furniture and numerous other articles, which might possibly come from infected centers or which might be infected with the germs of smallpox. Upon the refusal of these two men to be vaccinated a quarantine was ordered placed upon the premises where they resided and they were ordered to remain there until they consented to be vaccinated.

Smith and Cummings brought a proceeding in the court to test the legality of this action, and the same eventually found its way to the Court of Appeals.

The court in its decision discussed the provisions of section 24 of the Public Health Law and construes the power given to health officers under it.

Where persons are actually infected with or exposed to the disease, health officials may take such action as in their judgment seems best, but it is not sufficient for a health officer to arrive at the conclusion that there is a possibility of contagion or the spread of the disease.

In fact, in the exercise of their powers, health officers are bound to act upon facts and not upon theories or suspicions. Thus in the matter of nuisances it is not sufficient for the health officer to declare that a certain thing is a nuisance; it must be in fact a nuisance. There must exist certain facts and circumstances from which fair minded men would infer that a nuisance existed. So in the matter of vaccination the health officer cannot, unsupported by facts and circumstances, declare that the necessity exists for compulsory vaccination.

The court holds in the Smith case that no fact or circumstance was shown which would give the health officer any reason to believe that these two men required vaccination either for their own protection or that of the public.

The court however holds that where there are facts and circumstances existing which require vaccination in order to protect the public, the same may be compelled. If, for example, a person has been exposed to the small pox, such person may be prevented from going at large until he submits to vaccination. Persons coming from an infected district may be compelled to submit to vaccination before being allowed to enter the municipality.

Other instances will probably occur where compulsory vaccination may be insisted upon.

To sum the matter up, I am of the opinion that the law authorizes health officers to enforce compulsory vaccination wherever and whenever special circumstances exist which lead the health official, in the exercise of a conscientious judgment, to believe that vaccination will be a preventive of the spread of the disease.

Some latitude is given to administrative officers in the exercise of discretion, but they should always use that discretion courageously, having in mind the welfare of the general public.

All laws having for their object the preservation of public health and safety will prove onerous in certain individual cases, but the good of the individual must always be sacrificed to the good of the people at large.

The health officials have a high and important duty to perform. Patriotism is frequently supposed to be exhibited only upon the field of battle or in the exposure to life and limb.

It is a glorious thing to die for one's country, but it is a much more glorious thing to live for one's country and day by day discharge courageously and conscientiously the duties of citizenship. The faithful servant is the highest type of patriot. (Applause.)

Commissioner Porter—I am sure that we thank Mr. Andrews for his very admirable paper, and I have asked him to do us the further favor of remaining with us a little while in case we want to ask him a few questions.

The papers that you have heard, gentlemen, are before you here and open to you for discussion. I would like to hear from some members of the conference.

Dr. Green, of Hornellsville—I would like to ask Mr. Andrews a question. In the city of Hornellsville we have a parochial school. The children of that denomination refused to be vaccinated, holding (the pastor holds) they are not governed by the public school laws, and consequently when we have a case where we try to enforce vaccination the Protestant children, or their parents, at least, refuse to have them vaccinated and finally send them to the parochial school to overcome that. I would like an opinion on that.

Mr. Andrews—I would like to ask whether this school obtains any financial aid either from the locality or from the town or the state?

Dr. Green—No, sir; it is supported by subscriptions from the church.

Mr. Andrews—Well, then, I should be of the opinion it was like any other private institution. There is a constitutional provision which has invoked much discussion in respect to these schools. There is a provision in the Public Education Law which permits those schools, by appropriate action, to become public schools. That movement was started to that effect in this city about five years ago and was renewed. The people who started it (that was the case of an orphan asylum which would be similar) refused, however, to come under the rules of the local board of education, which is one of the requisites to receiving it. They therefore have never had any aid from the city. Hence they are like any private schools. The mere fact of it being a school would make no difference from any other aggregation of children. I do not think this provision, section 210 of the Public Health Law, applies to anything except public schools, which are those which are under the Public Education Law and receive support either from the city or the county or the state.

Dr. St. John, of Charlton—May I ask a question? Now in case the board of education or trustees do not make any attempt to provide vaccination for the school children they have to vaccinate, is it the duty in any way of the board of health or the health officer to see that the trustees do enforce that?

Mr. Andrews—In my judgment it is. I think the health officials are charged with the general duty of looking after the public health. I think that is a fair inference from the provision. As I stated in the paper, it is a division of duty; while it is placed upon the board of education and the school trustees, still I think if the school trustees or the board of education fail to do their duty then the health officials ought to call their attention to it, and if that has no effect I think they ought to bring a proceeding in the courts to compel them to do it. In other words, I do not think the public health officer ought to escape his responsibility for the general health simply because some other officer who has a duty in one particular direction, in a special field, fails to do his duty. I believe the court would order, in a proper proceeding brought by a health officer, the trustees or board of education to do it. I think that it would compel these boards to do their duty in that respect. It strikes me, however, that the provision is unwise for several reasons. In the first place, health officials are supposed to at least have some general ideas on the subject of public health and the necessity for health rules and regula-

tions. School trustees are not elected for any such purpose. They are supposed to have views on education, to be capable of selecting teachers and perhaps prescribing rules for text-books and things of that kind. They are not supposed to be trained to pass any judgment on health rules and requirements. Hence it seems to me the law in that respect ought to be amended and the whole duty ought to be placed upon the health officials. But I believe when they fail to do their duty that it is the duty of the health official to go into court and set the machinery in operation to compel the school boards to do their duty.

A Delegate—I understand, then, that a school commissioner or school trustee cannot permit any scholar to come into school unless vaccinated. Are there any exceptions to that? Can they make any exceptions? For instance, a child comes to school unvaccinated and he is excluded and returns with a certificate from a physician stating the child's condition is such he cannot be vaccinated; that it is not fair or right to vaccinate that child. Have the school commissioners got the right to admit that child on that certificate?

Mr. Andrews—I do not think they have. I think the rule is specific.

A Delegate—That is true, but I have found in a good many towns and cities school commissioners have admitted children under medical men's certificates. That occurred to an extent in my own city, that within five or six years I found 871 scholars with those certificates. I think in this way we are unfairly treated. I believe in vaccination, I believe these children should be vaccinated, but my patients come and say I want a certificate from you that my child may escape vaccination and yet go to school. If we refuse to give it, I am told if you don't wish to do it we know a doctor that will. Thereupon he is either obliged to stultify himself or lose the patient. That is a very unfair condition of affairs for the honest doctor. I immediately notified the superintendent of schools that all such certificates were from this day canceled, that they must have their certificates renewed to be vised by the health officers. It was perhaps *ultra vires* for me to do it, but the consequence was that of those 871 children that were there with certificates showing they were unfit for vaccination, there were only 34 that remained and about 850 were vaccinated, largely by physicians who had given them certificates. (Laughter and applause.)

Mr. Andrews—You know the law is not confined simply to pupils. It says any persons entering, and that applies to teachers. They are required to be vaccinated. If it were permissible by a certificate from a physician to escape vaccination, I am quite sure this law would be of no effect in a great many localities, because I think in this city, for instance, it is possible to get one physician at least who would give a certificate that in his judgment vaccination is dangerous. There are medical men who really entertain the conviction that it is not a preventive, that it is dangerous. I know of other localities where certificates of that kind would destroy the entire effect of the law.

A Delegate—Supposing a child is vaccinated and it is not successful, and it be repeated once or twice without success. How far is the law complied with by that fact? Is it necessary to have a successful vaccination?

Mr. Andrews—That is a pretty difficult question to answer, for the reason that there are cases where repeated attempts to vaccinate would fail. I was vaccinated myself when I was a child of five years of age, and I have made repeated attempts since that time, and I never had it affect me at all, I never was able to secure a successful vaccination since I was five years of age. I am inclined to think that what the law means is certainly a reasonable attempt to secure a successful vaccination. It is impossible for human language to frame a law which will perhaps meet every condition that may arise. A law ought to be construed with a view to the purpose which is thought to be effected by the law. Therefore, compulsory vaccination is such vaccination as will warrant a reasonable belief that the patient is immune. You see this whole thing resolves itself right down to the question which was discussed by the Attorney-General when he read to you from the opinion of the United States Supreme Court. That is one thing we ought always to bear in mind, that the government deals with people in a mass, it cannot deal with individual cases. There is hardly a law but what, in some cases, will work great hardship, and yet the general public good demands that these laws should be passed and enforced. Therefore, the individual must give way, he must subordinate his interest to the interest of the general public. So this law, like any other law, must be enforced in its spirit. Judge Vann, in the opinion of the Court of Appeals, discusses at considerable length the popular idea in regard to vacci-

nation, its efficiency and preventive qualities, and he says the common belief of the medical profession amounts to a fact of which the court takes judicial notice, that is, it is so great and universal in this belief that they take judicial notice, and therefore the law is a proper law for the enforcement of the police power of the state.

Dr. Hix, of Binghamton—I do not want to discuss those questions, but it is a gratification to me to be here to-day, as it must be to others who were here at the first meetings that were held of this nature, and to listen to what we have heard to-day. At that time, up until last year, I believe, all of the legal profession who addressed us maintained that under no circumstances could we enforce vaccination. It shows to us that our efforts and the efforts of sanitary officers and men interested in this work have availed something; in fact, it teaches us that our labor along the lines of education has reached the judges of the Supreme Court, and has elevated our profession as sanitarians and given us the position that we should have in order that we may enforce these laws for the protection of public health.

While I am on my feet I wish to say that it has been a gratification to me to hear the paper of our Commissioner. I am glad we have a Commissioner who has aggressive ideas. Especially am I glad our Commissioner believes we have something to do, and that if we do that something we will benefit mankind. The greatest effort, I think, should be to educate our people up to the idea that we can protect the public health. The officials in high authority in our government and courts should be educated along the lines that they should have a proper idea of sanitation. They have said to me that they doubt very much whether we could prevent these contagious diseases. I wish to say again that I am glad that we have a Commissioner who is ready to push all matter of sanitation. It will aid us to do our work and will be a great benefit to the community.

A Delegate—I would like to ask Mr. Andrews this question. There are two laws—the compulsory vaccination law and also the compulsory education law. Now if a parent or guardian refuses to have a child vaccinated, to what extent is he liable under the latter law?

Mr. Andrews—It is quite evident that questions may arise at a meeting of this kind which never would occur to a lawyer. I

am inclined to think that in the case of a proceeding to compel a child to attend the public schools, the court would also compel them to submit to any rules or regulations. They might, if you come to that, compel them to submit to the provisions of the compulsory vaccination law by compelling them to submit to the rules and regulations of the school officials. I think the laws must be read together, and that reading them together—of course, I want it distinctly understood this is an offhand opinion—but it occurs to me it would be absolutely ridiculous if they could take advantage of one law to evade the provisions of another, and therefore if a parent or guardian refuses to obey the compulsory education law and they set up as an answer that they don't believe in vaccination and would not submit to it, I believe the court would compel them to do both. I think the court has a right to compel them to submit to any rule or regulation which is authorized by law, whether they like it or not. It is just like a great many laws which every day people don't like to submit to, but which they have to.

A Delegate—Is it the duty of the health officer to vaccinate every child, or to see that they are vaccinated?

Mr. Andrews—I should say the duty of the health officer was to see to it. I do not know what the fact is in regard to it, but I assume there are certain health officers who are not physicians. I do not believe anybody except a professional man should exercise a duty of the profession.

A Delegate—I am not a physician and I have had to send twenty miles for somebody to see children are vaccinated. I didn't know whether I was obliged to or not.

Dr. Steele, of Mongaup Valley—There is one question I would like to ask. In our school districts we have at different times a movement to have the scholars vaccinated, whenever there is an epidemic or the probability of an epidemic around there, and during those times the scholars come in numbers to the different physicians to be vaccinated and receive a certificate to the effect that they are vaccinated. Now as these scholars pass out from the physician's office, sometimes the mother is right there with hot water and scrubs off the vaccine sore so the vaccination will not take. They carry the certificate right along to the school. This has happened at different times and we have no means I know of to prevent it.

Mr. Andrews—I think you have means to prevent it. I don't know any particular provision of the law that meets that particular case, but I am inclined to think that is equivalent to no vaccination at all. If I was the health officer, or school trustee, that child would not go to the public schools.

Dr. Steele—What would you do?

Mr. Andrews—I would simply notify the trustee, if I was the health officer, that the child had not been vaccinated, that the rule had not been complied with.

Dr. Steele—Well, they have been vaccinated and got the certificate and gone out.

Mr. Andrews—They have become possessed of a certificate under false pretenses.

Dr. Ware, of Richfield Springs—I would like to ask, when some child has entered from a district where a smallpox epidemic is feared and he is ordered to be vaccinated, and is vaccinated, should he be allowed to come to school then or upon the next day on presentation of his vaccination certificate, or should he be kept out of school until such time as the varioloid has developed?

Mr. Andrews—As I understand it, this is a case where the child has been exposed to contagion or comes from some infected district. Is that the question?

Dr. Ware—Yes.

Mr. Andrews—I think in that case you clearly have authority under the statute to keep these pupils out until you know they will not develop the disease. I do not think there is any question about that under the expressed terms of section 24 of the Public Health Law.

Dr. Russell—I do not believe any physician has the right to give any child a certificate of vaccination until he sees that vaccination has worked. (Applause.) The word "vaccination," the way I believe, means nothing unless it means that. By simply scratching the arm, that is not vaccination. Vaccination, literally speaking, means vaccination that has worked. I never give a certificate until I have the patient come around in three days, or four or five days, or such matter, and see for myself that the vaccination is successful; if successful the child receives a certificate. I believe it should be the duty of every health officer to issue these certificates for the safety of the people.

Mr. Andrews—I judge from what is said there is some work for the medical societies to do; that around certain localities some of the physicians do not seem to have very much of the spirit of the profession.

Dr. Rood, of Minoa—I might say, in answer to the question asked a few moments ago, that we give them cards requesting them to report inside of a week or at the end of seven days, and then if the vaccination has been good we give the certificate; if not, we revaccinate them.

Mr. Andrews—Of course, this whole matter comes to the question of whether the school board or trustees act in good faith. They are not compelled to take any certificate sent them. They can require the certificate of some physician of standing and reputation, or require the certificate to be vised by the health officer. It is like all laws, if they want it executed there is always a way to do it. If the official does not want to execute it, he generally finds some means of evading it.

Mr. J. J. Sweet, of Unadilla—In our town they are not only vaccinated, but obliged to show the physician the scar.

Dr. Bogart, of Johnstown—The law says, as I understand it, that no child shall be allowed to go to school except it has been vaccinated. It does not say successfully vaccinated, but does it imply it? Would it not be legal and constitutional for a local board of health to add to it by making it necessary that they be successfully vaccinated?

Mr. Andrews—Are you a physician?

Dr. Bogart—I am.

Mr. Andrews—I will have to answer your question by asking another. Is there any vaccination except what you call successful vaccination?

Dr. Bogart—That is the general acceptation of the term that people have; if they have a little scratch made that that is vaccination.

Mr. Andrews—Is not vaccination, the word itself, well defined in medical works and among the medical profession?

Dr. Bogart—Vaccination means using vaccine virus, introducing it into the circulation, and it gives certain manifestations when it is good. Now that is a legal question.

Mr. Andrews—I would not want to say positively that I am right about it, but my own view would be that vaccination means what you call successful vaccination.

Dr. Bogart—That you can't know under six or eight days.

Mr. Andrews—That is no great hardship compared to the benefits which are derived from the enforcement of the law.

Dr. Bogart—That would answer the gentleman's question. I agree with him when he states no certificate should be given until we had seen it and declared it good. That would obviate the whole difficulty.

Commissioner Porter—Is there any further discussion?

Mr. Nicholson, of Adams—I would like to say that that might work an injustice. My mother kept insisting that I should be vaccinated, and I was scratched on both arms, trying to have the vaccine work, and it would never work until after I was in the medical college. Now if that had been the rule then, I should probably have been a day laborer instead of a physician if I had to wait until the vaccination worked before I could enter school. (Applause.)

Commissioner Porter—If there is no further discussion, I will declare the Conference adjourned until 8.30 this evening.

WEDNESDAY, OCTOBER 4, 1905.

EVENING SESSION, 8.30 P. M.

Commissioner Porter—MY FRIENDS: At our evening session we have reserved the best that there may be to present to you. It is not always wise at the opening session of the conference to present all of our best speakers. We always reserve some. We have several for instance to-morrow. But for this evening it affords me the greatest possible pleasure to introduce to you a man not merely of State fame, but a man of national reputation, a man whose work has made itself known by its ability and by its results.

I take the greatest possible pleasure then in introducing to you a man to whom this Conference really needs no introduction, Dr. F. F. Wesbrook, President of the American Public Health Association, who will now address you. (Applause).

ADDRESS BY F. F. WESBROOK, M. D.

Director, Minnesota State Board of Health Laboratories, Professor of Pathology and Bacteriology, University of Minnesota, Minneapolis.

COOPERATION OF STATE AND LOCAL SANITARY OFFICERS IN THE PREVENTION AND MANAGEMENT OF OUTBREAKS OF INFECTIOUS DISEASES.

New York state is certainly to be congratulated that she has been one of the first to see the importance and benefit of bringing together her sanitary officers for the purpose of studying and putting into universal practice those methods best calculated to conserve her most valuable, because most basic, asset, viz., the health of her citizens. These annual gatherings, which afford opportunity for an exchange of experiences and the elaboration of new methods, are being watched by other states with almost an envious eye, and you must expect to see an imitation of your good work, which is after all the sincerest form of flattery.

The appearance on the program of the names of nonresidents would indicate your desire to extend the scope and benefit of your conferences by allowing others to profit by your experience, and at the same time by familiarizing yourselves with the "modus operandi" in other localities to utilize here in New York the work and results of others if the differences in local conditions are not such as to render them impracticable or inexpedient.

Every one must appreciate the value of such a broad-minded

policy, which seeks to make use of all potential possibilities in this day of complex and highly artificial mode of life where the health authorities must keep abreast of development in commercial, economic and scientific advancement in all lines in order to protect the public against itself.

In the practice of medicine, specialization and prolonged training along particular lines has developed to almost too great a degree perhaps, and the public endorses such specialization, in fact, demands it. In public health work on the other hand, where the stakes are tremendously greater, but where individual or personal interest and activity are replaced by an impersonal or public apathy, or even political opposition, the necessity for special training and experience is not so well recognized.

Boards of health are given responsibilities without corresponding authority or facilities for utilizing expert knowledge in those many phases of human activity which have to be recognized and dealt with in sanitary work. Your program for this meeting shows the many-sided character of the work where lawyers, clinicians, statisticians, engineers, pathologists, bacteriologists and chemists are all brought together, each to help the other in the solution of the problems which confront us, and of which, unfortunately, the public knows little or nothing. Add to this list the botanist, geologist and manufacturing expert in relation to water supplies and sewage disposal, and the animal biologist, who has to know the habits and identify in order to circumvent the mosquito, fly, moth, tick, or other animal in relation to yellow fever, malaria, typhoid fever, trypanosomiasis and such kindred diseases, and we realize a part of the complexities which confront the sanitarian.

Your conference has shown its realization of the necessity of special training in these diverse lines, and also of the great desirability for all sanitary officers to become conversant with principles and results so that enthusiastic and intelligent cooperation may be secured between those who are locally responsible and the State Department of Health, in the location of foci of disease and the study of other conditions which are inimical to the health of the state.

It is this very spirit of coordination which means success in any line of work, and is of especial importance in public health work since no one individual can hope to be familiar with all the technical details of its multifarious aspects.

I have appreciated very thoroughly the honor done to Minnesota and to myself in your invitation to participate in your conference, and although doubting really whether our methods and problems would be of interest or practical utility to you who are working under such different conditions, I had not sufficient self-denial to forego the pleasure of meeting with you, nor to lose the benefit to be obtained by myself and my state by learning something of the work of your organization.

It seems desirable first to explain some of our local conditions in order to facilitate an understanding of the scope of our work and responsibilities, and of the methods employed. Minnesota, like New York, is a large state, its southern and western portions being largely agricultural, whilst the northern portion is devoted to lumbering, and as the land is cleared to agriculture. In the northeastern district iron mining and shipping are the dominating industries. Railroad facilities are good. The climate does not very materially differ from that of New York. Whilst we may be lacking in the stability, actual power and prestige, which are associated with age and usage, we hope in some measure, at least, to compensate for these by our activity in a more or less clear field, and by seeking to avoid some of the complications and troubles which have arisen in older communities where vested commercial interests and deep-rooted custom seem at times to play at cross purposes with modern health protective measures. Attention now to such details as the pollution of streams and lakes, and to the formulation of intelligent regulations in regard to infectious disease will, we realize, save us many lives and much money.

In Minnesota we have a State Board of Health consisting of nine members, all of whom are usually physicians, one of them being secretary and executive officer.

Unlike the older states, Minnesota's chief educational institution is the State University, which is generously supported by state funds, and has well equipped scientific, engineering and medical departments. Quite recently individuals have seen the reasonableness of giving their support and donations to such a State University, and it is to be hoped and expected that it will continue to be the chief, if it cannot be the only educational and degree-conferring body.

The closest and most harmonious relations have existed between the State University and the State Board of Health from the very beginning, and when, nearly ten years ago, the

Board of Health wished to establish a laboratory the Regents of the State University provided the necessary quarters. Some three years ago the State Board of Health erected a laboratory for research in diseases of animals upon the University campus, which is now used for housing experimental animals, and is situated within fifty feet of the new Institute of Preventive Medicine and Pathology at present in course of erection by the University, and in which the head laboratories of the State Board of Health and the laboratories of pathology, bacteriology and hygiene of the State University will be all housed under the one direction.

This has the very decided advantages of affording to the University the very best means of teaching public health to its medical and engineering students. It gives to the State Board of Health the stimulus generated by the contact of its workers with the research and educational facilities of the University scientific and medical departments, and enables it also to see that the medical graduates of the University, who constitute now the major portion of the medical profession of the State, are properly instructed as to their duties, and responsibilities, should they later become health officers. This is also true for the recently established courses in municipal and sanitary engineering. Some teaching of hygiene is also possible in the summer courses given by the University to school teachers. Special graduate courses, including instruction in its legal aspects of preventive medicine statistics, pathology, bacteriology, chemistry, biology and engineering are contemplated by the University for present and prospective health officers whose qualifications for a special diploma of public health may be determined by the State Board of Health or by the American Public Health Association. This will supplement the work of the State Sanitary Conference, which has been temporarily suspended in order to effect some necessary changes.

Realizing fully that our conditions, facilities and system differ very materially from those which obtain in many other localities, and that, consequently, our methods may be neither applicable nor suitable elsewhere I am still glad to present certain of them in the hope that they may be freely discussed and criticized, so that we may be able to improve upon them and insure more perfect utilization and coordination of all forces which may be potent in finding out new truths concerning, first, the spread, and, secondly, the suppression of disease, in the education of the

public as to its well-being, and in the formulation and execution of intelligent protective measures.

My own work has had chiefly to do with the application of laboratory methods to public health problems, but perhaps by reference to certain phases of such work the plan of coordination which has been attempted throughout may be illustrated.

In the application of laboratory methods to public health it is not strange that misapprehensions should arise in the minds of the public and of the medical profession. All technical work paid for by, and intended for the good of, the public should have a public hearing. In public health laboratories the chief utility of the work should be to serve as an immediate or future guide to protective or restrictive measures. This is not necessarily a limitation to pure routine. Research which has a practical bearing is neither less scientific nor less interesting because of its immediate or potential applicability. Research in public health laboratories is a necessity, not alone for the good of the public, but for the sake of the worker himself, since nothing is more fatal to efficiency than a belief in the perfection and infallibility of the methods utilized, or a complete satisfaction with results achieved. There should, however, be no coercion on the part of individuals or strong political or commercial forces as to the problems undertaken, which should have a public and not a private bearing.

Those which are of the greatest value to the greatest number, and those for which there seems to be a reasonable hope of successful solution, should receive the first consideration. Often requests or demands are made by individuals whose knowledge of the possibilities are in inverse proportion to their vehemence. Sometimes this is a result of ignorance or carelessness, whereby facts and conditions which should be carefully noted at the time and which go far to solve the questions at issue are ignored, whilst attempt is made to fix the responsibility for arriving at a definite conclusion and affording the necessary guide to action upon a laboratory worker or other expert without giving him the necessary materials in such conditions as to insure satisfactory results, and with no collateral data to guide him.

Laboratory work should be used to supplement other methods of observation and not to replace them, but too often both in medical practice and in public health investigation the tendency is to rush to the laboratory in order to receive assistance when a moment's thought and the intelligent use of the other less deli-

cate methods would yield the desired results more quickly and accurately.

In municipal health work, the laboratory is in close contact with the problems to be studied, but in state work somewhat different conditions obtain and it becomes necessary for the laboratory men or other experts to visit the locality under investigation with the executives or inspectors in order to see and know the actual existing conditions and thus be able to guide and safeguard their work with intelligence.

It is impossible in many lines of work to render valuable service by the examination of shipped specimens, even when local data accompanies or precedes them. This is especially true of water and sewage investigation work and in the study of epidemics where the experts must visit the field not only to secure data, but in order to begin examinations on the spot. Wherever possible, it will be found to be advantageous to send the expert or laboratory man into the field rather than to depend upon the "correspondence school" method of affording diagnoses and of securing such information as may be a guide to logical and intelligent action for removing or preventing unsanitary conditions. Furthermore, to be of value to a public health administrative body, each piece of work should be capable of utilization as a guide to future work and routine investigation done in this spirit becomes research and of consequent value to sanitarians in general.

Every individual who uses a public health laboratory for securing information should feel under obligation to supply, in return for such gratuitous expert report, all procurable data in regard to past and present conditions and the subsequent history of events, so that the whole may be recorded in such form as to be of permanent value. No work should be allowed to assume such routine form that it ceases to possess interest.

When so much emphasis is laid upon the use of scientific methods in medicine and public health, there is danger that in the recognition of the value of such laboratory investigation and minute technical observation, the absolute necessity for sound judgment and ability to appreciate the relative values of the points brought out by such precise methods may be underestimated. It is too often assumed that in the various chemical, bacteriological, biological or mechanical tests employed in expert or laboratory work, the correct in formation and conclusions are rapidly and even almost mysteriously attained. Many of the

methods are most laborious and time consuming. The microscope, the culture tube and the chemist's balance and retort are extremely delicate implements which bring to light many new and sometimes complicating factors. Really, at times they almost seem to increase the difficulties and to lead away from practical results. Here is where the necessity for sound judgment, so fallaciously designated "common sense," becomes most important and where a knowledge of all local conditions must be considered and correlated with all other data. The only remedy for apparent discrepancy is more data and further study.

The importance of close contact of laboratory workers with field problems cannot be overestimated, although in large and populous states it may be more difficult to attain.

Realizing that nearly every phase of human knowledge must be utilized in successful effort to protect the health of the public and that the administration of the work is best accomplished through one executive head, it is easily seen that the executive officer must keep in touch with the other phases of the work and the composite judgment of all available experts should be secured and included in any final opinion which the executive voices, so that expert work serves as the basis of all executive action.

Although in Minnesota, on account of our immaturity and the absence of demand in many lines, we have relatively few experts, attempt has been made to coordinate our health work. The necessity for utilizing laboratory trained men in the field and of delegating temporary executive authority to them when it was not feasible for the executive officer of the State Board of Health to accompany or remain with them was fully demonstrated in our first years of work. Amongst other duties, the State Board of Health is responsible for the sanitary condition of the state institutions, which include state hospitals and asylums for the insane, state schools for the deaf, dumb, blind, feeble-minded and for dependent and neglected children and correctional and penal institutions. Almost the first problem encountered in 1896 and '97 was endemic and epidemic diphtheria in the State School for Dependent and Neglected Children at Owatonna, Minn. Evidence of wide-spread infection of the children with *bacillus diphtheriae,* at times without corresponding clinical evidence of disease, led to a thorough investigation. After many visits of the executive officer and the director of the laboratory, a temporary branch laboratory was established at the school and Dr. McDan-

iel, a member of the laboratory staff, was placed in charge for three months. Every child and inmate was examined culturally and physically. Finally, owing to the widespread infection with *bacillus diphtheriae,* every individual was regarded as suspicious and fifty-two isolation cells or rooms were prepared for the individual segregation of the children during the time of their examination. This was to prevent the possibility of the exchange of the flora of the nose and throat between individuals, such as is possible where a number of children are allowed to play together in one room. This collection of isolation rooms was designated for convenience " the filter."

Each child was examined and re-examined until three successive cultures of both nose and throat showed the absence of *all* diphtheria and diphtheria-like bacilli. After the first and third double negative each child was given a disinfectant bath and the room and utensils were sterilized and after the third double negative the child was placed with other children similarly " filtered " into a freshly sterilized cottage. Of the 250 inmates, 167 had emerged as a supposedly diphtheria-bacillus-free " filtrate," but upon re-examination individuals were found to be *still* or perhaps *again* infected.

Here the laboratory results dominated and the bacteriologist made the examinations and supervised the sterilization of rooms and clothing, the inspection and medication of throats and noses and in all emergencies represented the State Board of Health.

In three months 5,000 examinations of cultures were made and much laboratory work in the determination of efficiency of sterilization and similar matters was accomplished. The routine of school life was interrupted, the state spent many hundreds of dollars and the laboratory staff exhausted itself, all to no immediate practical purpose. We were all loath to admit that it was a more or less normal condition for a large percentage of the population of such an institution to be infected with diphtheria bacilli and did our best to eradicate the infection. The inmates for the succeeding year were freer of disease than at any time prior to the investigation, so that at least some practical benefit seemed to result from the thorough medical inspection and special supervision to which they were subjected. By these studies we in Minnesota, and I believe also, to some extent, health authorities in other communities, have been able to arrive at practical results in the control of institutional infection.

Some more detailed consideration of our diphtheria work may serve to illustrate conditions and methods.

Diphtheria.

In the diphtheria work of the Minnesota State Board of Health the problems have naturally arranged themselves into three main groups.

I. The routine work of dealing with diphtheria as it occurs in family life.

II. Widespread epidemics in which the day schools have to be closed.

III. Infection which gains entrance into institutions in which children or other inmates are housed, employed, taught or confined, and where great opportunity for the spread of infection is present.

I. Diphtheria in Family Life.

The routine work of the State Board of Health is probably but little different in Minnesota from that in other parts of America, except that it is confined largely to country towns, villages, small cities and rural communities. In general, isolation of suspicious cases is followed by the imposition of official quarantine, based on a positive report mailed or telegraphed from the laboratory of the board to the attending physician and the local health officer. Quarantine is maintained until a negative report or, when practicable, two successive negatives are made on throat cultures. Unless positive, no report is given on fresh preparations or, in fact, on anything other than a satisfactory culture made at the bedside, forwarded by the local physician and incubated in the laboratory for eighteen hours. In villages and towns, as also in smaller cities, no difficulties are presented, and the use of the laboratory is becoming more widespread. In country districts, where it is necessary for physicians to make long journeys in order to see their patients, or where there are not physicians available, it is sometimes impractical to insist on a rigid adherence to the methods outlined for general use. Physicians are urged, and the public is educated, to take advantage of the laboratory diagnosis as a means of shortening the quarantine period and minimizing the dangers of infection.

Observations covering the years 1901 and 1902 have shown that in clinical cases of this disease diphtheria bacilli have disappeared in 3 per cent. by the seventh day, 27 per cent. by the fourteenth day, 51 per cent. by the twenty-first day, 83 per cent.

by the twenty-eighth day, 93 per cent. by the thirty-fifth day and 100 per cent. by the seventieth day.

There is an occasional long persistence of the virulent types of *B. diphtheriae*. A school girl, aged 10 years, under the care of her father, one of Minnesota's best physicians and health officers, was found to harbor diphtheria bacilli for 109 days. On the seventy-second day the bacilli were isolated in purity, tested and found fully virulent. A school teacher, a young woman aged 20, who had clinical diphtheria, still showed typical virulent diphtheria bacilli, in 14 successive positive examinations, until after the eightieth day. A boy, aged 5, still had diphtheria bacilli present 79 days since the disease began. On the forty-sixth day the bacilli, isolated in purity, were virulent for guinea pigs. Notwithstanding these occasional instances of long persistence, it is plain to all who have studied the question that the laboratory report on the presence or absence of the diphtheria bacillus affords the only satisfactory basis of quarantine.

In Minnesota, when laboratory examination is impracticable, an optional time limit of four weeks from the date of disappearance of last symptoms is permitted, but not encouraged. The laboratory examination will, in most cases, very greatly shorten this time, and, since it is the presence or absence of the diphtheria bacillus which constitutes the danger or freedom from danger, the laboratory examination is the only basis of quarantine which should be permitted.

II. Infection Demanding Action on the Part of the School Authorities.

When diphtheria becomes widely distributed in a community, necessitating the closing of the day schools, or when the disease has persisted throughout the summer months, appeal is often made to the Minnesota State Board of Health for aid in determining a safe course which will enable the authorities to keep the schools open without endangering the health of the public.

Within the last five years this problem has frequently presented itself and by degrees a simple system has been evolved which has been found to yield most satisfactory results. It requires harmony between the local board of health and the school authorities if, without the constant supervision of some member of the executive or laboratory staff of the State Board of Health, the local authorities are to be depended upon to carry out the necessary details.

In one recent investigation a most efficient medical health officer happened also to be chairman of the local school board, and except for ten days' time given to the inauguration of the work and the illustration of methods of tracing infection and some slight technical instruction, the work has been carried out entirely by the local authorities. The actual bacteriological examinations and report are made, of course, by the laboratory staff of the State Board of Health.

The only remaining factors necessary to successful work are the requisite executive authority, the confidence of the public and a fully equipped laboratory with a staff capable of meeting satisfactorily such emergencies. In this school and institutional work the demand on the laboratory is, at times, rather heavy.

In December, 1904, in addition to other heavy routine work and considerable traveling, it was necessary for the laboratory staff to examine, record and report on over 3,500 diphtheria specimens, or nearly 9,300 for the four months ending January 1, 1905. The necessity for a smoothly working system is thus made apparent, since the school openings all occur at the same time and several examinations may be in progress at one time, each one involving the examination and supervision of from 100 to 450 children. The work may, perhaps, best be illustrated by the details of one of a large number of such investigations.

During the year 1900, Park Rapids, a town of about 1,000 inhabitants, situated in a lumbering community 350 miles from the laboratory, became badly infected with diphtheria. Not only school children, but adults also, were attacked. The neighboring lumber camps and tributary territory became involved, and the disease persisted throughout the winter and did not disappear even in the late summer months, owing to repeated reinfection from outside sources. In August, 1901, on the appeal of the locality, the executive officer of the State Board of Health and the director of its laboratory visited the town to investigate conditions and outline methods for the control of the disease which would interfere as little as possible with the routine of affairs and which might still permit the opening of the schools, to which the citizens had looked forward with dread.

A careful study was made and all cases of diphtheria then in existence were investigated and all rumors and suspicions of possible cases were followed up. At a joint meeting of the local health board, town council and school board matters were thoroughly discussed, and it was recommended:

1. That the opening of school be deferred.

2. That the teacher and children of each room in the school be called together at the school at a specified time on a particular day to be set for each room and publicly announced.

3. That a representative of the State Board of Health be present, who would take nose and throat cultures of each one of the children. The cultures were to be forwarded to the laboratory for examination and report.

4. That each child and each teacher who showed diphtheria bacilli be excluded from school until he and all his family were found free from infection.

Dr. E. H. Beckmen of the laboratory went to the town and spent nearly two weeks in this work of taking cultures and investigating the environments and history of all families in which positive laboratory findings were reported, and in securing and recording data, including maps, showing location, distribution and dates of infection. As a result over 350 school children were examined, more than 1,200 examinations made, school opened one week late, and diphtheria disappeared under the conditions and at the time of year when there was every reason to expect its increase. The willing cooperation of the town council, school board and general public was easily secured and retained. The educational value of the work has been as apparent during the subsequent years as was the resulting practical utility at that time.

III. Diphtheria Infection in Institutional Life.

This affords a problem in which the difficulties are in direct relation to facilities afforded for the exchange of nose and throat contents between the inmates.

Among adult prisoners, especially where isolation is almost complete, there is little danger of the spread of infection. On the other hand, in charitable institutions, where the children are constantly associated in large groups, at play, at school, at work and in dormitory life, the chances for the spread of infection are not only greatly increased, but additional opportunities for its introduction from outside by newcomers have also to be recognized.

During the past nine years the Minnesota State Board of Health has been called on to take charge of epidemics of diphtheria in a number of state and private institutions in which the variation in conditions of life and environment was very great.

A recent investigation may serve as an illustration of methods and results. The State School for the Deaf at Faribault provides for the housing and instruction of over 280 pupils, mostly children, but above the age of 8. Certain of the pupils are state or county charges, but all of them are returned during the summer vacation, either to their own homes or to a home provided for them. Most of the employees and teaching staff (about 50) reside, not in the institution, but in the town. Diphtheria appeared September 25, 1904, having been prevalent in Faribault for a number of months both in the residents and in the employees of a boarding school for girls. Owing to the increase of infection, the executive officer of the State Board of Health was called to give advice and aid. On his recommendation a member of the laboratory staff (Dr. McDaniel) went to the school December 2, 1904, and found 17 clinical cases, 3 more appearing on the following day. The general arrangements provide dormitories for the girls, in which from 6 to 12 are accommodated in single beds. In a separate building similar accommodations are available for the boys, the building being divided by a wall in the center so as to separate them into two groups, according to age. Meals are provided for all pupils in one dining-room. A separate new school building is available for their instruction, although some pupils are still taught in the main building. The clinical cases had all been removed to the school hospital, a separate frame building.

Immediately all the employees and teachers were examined by nose and throat cultures for the presence of diphtheria bacilli. All infected individuals were quarantined in their homes or isolated in the institution. All who showed suspicious bacilli were re-examined, and if they failed to show typical bacilli on the second examination were released.

As it was impracticable to examine nose and throat cultures from all pupils in one day, they were grouped according to the possibility of providing isolation in sleeping quarters. These were practically according to age and sex, the smaller children being examined first, because they showed greater infection. As examination proceeded the girls shown to be uninfected by double negative cultures of both nose and throat were housed and fed in the detached and freshly sterilized school building under the supervision of uninfected teachers. Similar arrangements were made for the boys in the manual training building. The children showing suspicious bacilli were kept in their quarters until

two re-examinations had been made. The infected well children (about 28 per cent.) were isolated under the care of a nurse in the various schoolrooms in the north wing of the main building. Especial attention was given to the cleansing of their noses and throats by alkaline washes, followed by formalin. Antitoxin in 2,000 unit doses was also administered later.

As soon as the inmates were shown to be uninfected by three successive nose and throat cultures they were placed with the uninfected groups, which gradually increased in number, and were returned mostly to their homes, but partly to the old dormitories, which had been thoroughly disinfected. Only two new clinical cases developed after the completion of the segregation, and the disease was eliminated, although there were many difficulties incident to overcrowding, some difficulties in instructing the pupils, and some due to the facts that the pathological conditions of the nose and throat which originally gave rise to the deafness were favorable to diphtheria infection, and that the use of the sign language employed increased opportunities for infection from the hands.

In summarizing our diphtheria work, the following points are apparent:

1. An adequate laboratory staff and equipment is essential, since only by thorough laboratory examination can the presence of possible danger be determined.

2. It has been found convenient to utilize institutional laboratories when available where the members of the laboratory staff of the State Board of Health can examine cultures on the spot when there is urgent need of haste.

3. Repetition of examination of both nose and throat specimens is advisable in all cases and especially when suspicious bacilli are found.

4. It is unsafe to place hitherto uninfected individuals who develop sore throat with clinical cases of diphtheria. They should be isolated until examined bacteriologically, since they may be infected, not with diphtheria bacillus, but with streptococcus, the spirillum of Vincent, blastomyces or some other micro-organism, and, therefore, may be exposed unnecessarily to diphtheria infection. This has happened repeatedly in the Minnesota investigations.

5. Executive action must be taken on the basis afforded by the laboratory; therefore, it is essential either that these two branches be kept in the closest touch or that in the work of inau-

guration and supervision of methods, a laboratory trained man be placed in charge. After the system is well started, competent local medical authorities may be depended on for its continuance if they have been sufficiently impressed with the necessity of care in details.

6. That such methods will give satisfactory results and are entirely practicable has been shown in the experience of the Minnesota State Board of Health under conditions which present the greatest possible variation. Three epidemics have been thus suppressed in a lying-in hospital in Minneapolis, where there was no adequate nursing force, where the women, before and after confinement, are employed in the housework of the institution, where the babies are left in charge of different mothers at different times, and where, also, the almost daily admission of fresh inmates adds to the opportunities for introduction of infection. A method which has proven satisfactory in lying-in hospitals, boarding schools, schools for the deaf, homes for children, insane hospitals and other such miscellaneous institutions in a climate such as that of Minnesota, would certainly seem capable of utilization under nearly any condition which might arise.

7. The experience of Minnesota would seem to point decidedly to the conclusion that diphtheria infection is transmitted usually by almost direct exchange of the flora of the nose and throat.

8. In institutional and school life the more independent the individual and the greater the facilities for individual isolation the greater the freedom from diphtheria infection and the easier is it to eradicate the disease.

Water Investigations.

Feeling the necessity for a clear understanding of the responsibilities and scope of the State Board of Health in relation to water supplies, a circular was prepared and distributed. In it the following divisions of the State Board of Health's work were made:

1. Problems pertaining to new supplies.

2. The investigation of the natural water supplies of the state and of their pollution and purification.

3. Investigations of epidemics of apparent water-borne disease.

A general discussion of the problems involved in installing new supplies or improving old ones was followed by a paragraph on methods which contained the following:

"There is at present so much misconception concerning the proper methods of procedure that the attention of the State Board of Health is frequently drawn to contemplated installation or change in the existing water supply by newspaper clippings, complaints of inhabitants or even by the receipt in the laboratory of a bottle or jug of water unaccompanied by any data further than that the locality desires to make a change and wishes to know whether the water from which the sample was forwarded will make a satisfactory supply. The investigation of a public water supply usually calls for frequent examination and always requires continuous supervision. It seems best, therefore, to give briefly the methods which would operate best under existing laws and regulations.

1. Notification to the State Board of Health by local authorities of the conditions which render it desirable to install a new or improve an existing water supply or system of sewerage.

2. Before letting contracts or proceeding with the work full local data, including copies of proposed plans, to be forwarded to the State Board of Health to be filed permanently with that Board.

3. The State Board of Health to send trained representatives to assist in the accumulation of essential information and the examination of the physical, chemical and bacterial conditions of the proposed supply.

4. Consideration by the State Board of Health of all information furnished by the local authorities and by its own representatives.

5. Indorsement of proposed plans or suggestion of changes by the State Board of Health.

6. Completion of the plant.

7. Final testing of the plant and water by the State Board of Health.

8. Final indorsement or condemnation by the State Board of Health.

9. If enlargement or extension of a plant is desired, the State Board of Health to be notified and furnished with full particulars, accompanied by plans.

II. The Investigation of the Natural Water Supplies of the State and of Their Pollution and Purification.

Under this caption a general discussion of the problems was summarized by giving a definite plan of procedure, which contained the following:

(1) Continuance of the investigation of those lakes and rivers which have been under study.

(2) When the attention of the State Board of Health is drawn to certain matters of general interest which properly come within its scope, they shall be carefully considered and, if possible, investigated.

(3) Trained representatives of the Board to be sent out into the field at stated intervals to collect information concerning the sources and surroundings of the waters. This to be filed as a permanent record under each locality. It should consist of maps, sketches, photographs, plans and specifications as well as written or printed data. Statistics concerning the quantity of the water available, rain fall, temperature, etc., must also be available.

III. Investigation of Epidemics of Apparent Water-borne Disease.

As was stated in the opening paragraph of the circular, the State Board of Health can only undertake the investigation of problems which seem to have a direct bearing upon the health of the public. There is a great misconception regarding the function of the board in relation to the examination of miscellaneous samples of water. Frequently it happens that specimens contained in cans, jugs and bottles of varying size and degree of cleanliness and accompanied by no data or at most by a simple request for an immediate report are forwarded to the laboratory. The board has frequently made examinations of such samples, which examinations have occupied days or weeks of valuable time. This was more to stimulate a local interest in public health than on account of the value of the examination. Before reporting upon such samples it is necessary to obtain the fullest information concerning local conditions in order to avoid giving misleading reports, but it has often happened that the local authorities have taken no further interest in the matter after the specimen has been forwarded, and there has resulted an absolute waste of the state's time and money, the laboratory examination being without avail. It is easily seen that a report upon a mere laboratory examination of water without a full knowledge of local conditions is of no value to the locality and may be absolutely misleading. On the other hand, it is of no value to the state as a matter of record or as a guide to future action in

that or other localities. The State Board of Health, having more legitimate and important work to do with the funds provided, does not feel justified in undertaking time-consuming, laborious and expensive examinations for the satisfaction of mere curiosity or in order to save the time and energy of those who can, in most cases, solve the problems for themselves by a close scrutiny of local conditions.

It frequently happens that when disease occurs in a neighborhood, the water is suspected as a cause. Without making inquiry or investigation into the history of the patient or patients, and too often without even making a diagnosis, a sample of water is forwarded to the laboratory of this board with a request for examination. If a reason is given at all for requesting the examination it is frequently worded "suspected typhoid" or "diphtheria" or "has peculiar taste" or "is this water fit for use in boilers?" "for butter-washing?" "for use of cattle?" etc.

Important evidence can be obtained by a careful examination of the local conditions, and if there is visible evidence of possible or actual contamination of the water by excrement, this is of far greater value than any laboratory evidence of contamination. One should not hesitate to condemn for domestic use such a water supply. There is no need for a chemical or bacteriological examination as a basis for such action.

When cases of illness occur, the first step is to make a diagnosis. If the disease be typhoid, immediately the most careful inquiry should be instituted in order to learn what opportunity the patients have had for becoming infected. It should be ascertained whether the patients have visited localities in which typhoid fever has occurred or whether they have entertained any visitors who might possibly have brought the infection. After careful investigation along all possible lines, if it is found that representatives in all families using a given water supply are affected, whilst others using other supplies are not affected, full particulars concerning the disease should be forwarded immediately to the State Board of Health. These particulars should include the names, ages and addresses of all patients, together with the dates of the first appearance of symptoms and the circumstances under which the disease seems to have been acquired. A record also of the unaffected members of the families should be forwarded and, in fact, all the information which has led the local authorities to believe that a particular water supply is the cause of the disease.

Whether an investigation seems desirable or not, all cases of typhoid fever should be reported to the State Board of Health.

Upon the receipt of adequate information, it should be the policy of the State Board of Health, so far as its funds will permit, to investigate fully the conditions, where the health of the community has been shown to be probably jeopardized and where the local authorities have shown themselves willing to take the initiative to the fullest degree. The State Board of Health should, when it seems advisable, send out a trained representative to study the conditions with the local authorities. If, on investigation of such conditions, laboratory work seems necessary, samples can be collected at this time and, if feasible, arrangements made for further collection and submission of samples at stated intervals.

A chemical or bacteriological examination of a sample of water affords only collateral evidence as to the presence or absence of infectious material. Such examinations should, therefore, only be made when a full investigation primarily on the part of the local authorities shows the probability of the connection of a public water supply with the occurrence of disease.

Bacteriological examinations to be of any value must be begun at the place under investigation. It is therefore necessary to send a bacteriologist from the laboratory to collect local information and to begin the bacteriological examination on the spot and at the same time he can collect samples for chemical examination.

By using this circular for educational purposes, by discouraging the examination of miscellaneous samples and by limiting the work in responses to requests to the investigation of conditions which had a direct and appreciable value on public health, and by pushing forward the survey work with the United States Geological Survey, a considerable advance has been made. This survey work consisted in the selection of certain sampling stations on various important watersheds, which were visited periodically, the localities being grouped to facilitate traveling and for the sake of economy and chosen with reference to sources of pollution and location of effluents.

To each place visited there were forwarded by express cases for collecting bacteriological and chemical samples. Bottles of water for sanitary chemical analysis were expressed to the laboratory. A field kit containing the necessary apparatus was used to make the preliminary bacteriological examinations. The bac-

teriological outfits were then re-expressed to the laboratory for incubation, examination and record. This manner of commencing the bacteriological work in the field proved so satisfactory that it has been generally employed in all water examinations undertaken by the laboratory since that date.

Since the commencement of collaboration with the United States Geological Survey it has been considered especially important to secure all possible information in sections visited concerning matters of hydro-economic importance. A large amount of time has been spent in gathering data on every feature of municipal activity which has to do with water and public health or public utilities. At every place where it has been possible to do so a personal inspection has been made of water-works systems, sewerage and effluent-discharging factories; by personal interviews there has been secured minute detailed information on all features of the water and sewerage systems, ice supply, sewage-disposal works, existence of water-borne disease, and general water resources of the region; at a large number of places photographs illustrative of pertinent points have been taken. In this manner there has been obtained for permanent file a large amount of matter in the form of photographs, maps, sketches, effluent blanks and typewritten reports of special features. More or less complete data regarding 115 cities and villages in Minnesota are now recorded.

The information thus obtained and filed for frequent reference will prove invaluable in all future work done in Minnesota on the quality of water. When special problems in any locality demand investigation, days and weeks of preliminary inquiry will be rendered unnecessary by immediate reference to a file from which a complete mental picture can be formed of the city with its surroundings, its factories, the condition and equipment of its waterworks, the extent of its sewerage, its geological features, its topography and other facts the absence of which make the preliminaries of investigation so time-consuming. All analyses made are filed in a similar manner, alphabetically by locality, so that they are ready for reference at any time. Even during the brief period that the collaboration work has made it possible to secure this data, a number of instances have occurred where the material already on hand has been of great assistance. This data have been supplemented by written tabulated information furnished by health officers, city engineers, superintendents of waterworks and of various factories and industrial plants,

by ice dealers and others, and our files are fairly complete, being in nearly all cases more voluminous, accurate and systematic than those of the locality itself.

Already we have had occasion to furnish other localities in and out of our state with information in our possession. We wish in this way to establish not only accuracy of detailed record, but to see that it is permanently though easily accessible.

Similar lines of investigation of milk supplies by sending trained men throughout the state who are provided with field laboratories have been recently undertaken. In all of our former work on the investigation of diseases of animals the preliminary laboratory work was done in the field. In fact we are using men with special training in all our state investigation work so far as it is possible and seems demanded.

In the routine examination of cultures from diphtheria patients, of sputum for the presence of B. tuberculosis, of blood for the presence or absence of the widal reaction in typhoid fever, and even of material from the central nervous system for the diagnosis of hydrophobia, shipped specimens usually suffice if full data accompany them, but the absolute necessity of data is not always fully appreciated and frequently oversight of some crucially important step, in the collection or transmission of the specimen, precludes forever the possibility of rendering intelligent assistance to the local authorities.

Although our new laboratories will provide for all phases of diagnostic work, and even for the Pasteur treatment of rabies, and although they are situated in the most accessible portion of the state, we realize that remoteness from the seat of investigation is a handicap which is not entirely overcome by the free utilization of institutional, hospital and private laboratories as temporary headquarters by our staff, and we are planning for a series of branch laboratories. The first of these was established in Duluth on August 1, 1905, and is a State Board of Health laboratory, tributary to and under the direction of the head laboratory in Minneapolis. St. Mary's Hospital and the Duluth city board of health share the expense with the state. Others are planned, because it is believed that in the saving of time, the accuracy and fulness of the information obtained and the applicability of results of laboratory investigation to the work in hand much is to be gained.

It has been suggested, however, that for many phases of the

work, a traveling laboratory, which can readily be provided in a railway coach, would be very advantageous, as it would permit laboratory work to be finished more quickly and in any event it could be begun on the spot and completed in one of the branch laboratories or at headquarters. In general problems, including epidemics of the various bacterial or parasitic diseases, water, milk and sewage investigations, and particularly epidemics of diphtheria in the day schools of small towns or villages, such a traveling laboratory side-tracked for the purpose would be most useful. The financial consideration would be very much less than that involved in the provision of innumerable laboratories on a permanent basis in rural districts or small towns and villages. Such small laboratories, unless they are in constant use and provided with workers in all lines, are apt not to be ready for immediate use and their equipment may also be deficient. The chief benefits secured by such railway laboratories would be in the coordination of effort by authorities and the instruction of the public in its own welfare.

After all it is this latter matter, viz., the instruction and education of the public in matters which affect its welfare and health, which is most vital to our success. By such meetings as these where we all, by becoming familiar with the work of others, place ourselves in the position to use that which seems best for our own purposes, and where we can all unite in the teaching and practice of those methods which are logical and intelligent, we are afforded a starting point and there will ultimately radiate from such an organization the necessary and vital truths which will cause the public to demand that it be protected. At times it seems as if the public desired only one thing, viz., to be let alone, and the sanitarian is rarely appreciated in his work of making individuals do that which they do not wish to do for their own and others good.

We shall hope, however, that the infection of knowledge may be as rapid and rabid in its onslaught as some of those conditions which we are trying to better. When once the people can be shown the reasonableness of protective measures and the gloomy semi-mysticism which has unfortunately so long dominated things medical and sanitary is replaced by the sunlight of accurate knowledge, we may expect to see the usual germicidal result which may be expected to follow the application of sunlight, and apathy and opposition will be banished forever.

NOTE—Reference to and free quotation from the following papers has been made:

1. "A Preliminary Communication on Bacillus Diphtheriae and its Variants in a School in which Diphtheria was Epidemic." Wesbrook, Wilson, McDaniel, Adair. British Medical Journal, April 16, 1898.

2. Biennial Report, Minnesota State Board of Health, 1899-1900. References to special investigations, State Public School for Dependent and Neglected Children, Owatonna, pp. 439, 442, 514, 583.

3. "Bacteriological Diagnosis of Diphtheria in Minnesota." Wesbrook. Biennial Report, Minnesota State Board of Health, 1899-1900, p. 594. Also St. Paul Medical Journal, April and May, 1900.

4. "Varieties of B. diphtheriae." Wesbrook, Wilson, McDaniel. Transactions Association of American Physicians, 1900.

5. "Report on Diphtheria Bacilli in Well Persons." Journal Massachusetts Association of Boards of Health, July, 1902.

6. "Problems in the Laboratory Study of Diphtheria." Wesbrook. Chairman's address, Laboratory Section American Public Health Association, New Orleans, Dec. 8, 1902.

7. "Diphtheria Infection in Minnesota." Wesbrook. Transactions American Public Health Association, Havana, Cuba, Jan. 11, 1905. Also Journal of the American Medical Association, March 25, 1905.

8. "The Relationship of the Minnesota State Board of Health to Water Supplies." Wesbrook. St. Paul Medical Journal, October, 1904.

9. "Water Investigations in Minnesota." Wesbrook and Dole. Northwestern Lancet, March 1, 1905.

10. "The Laboratory in Public Health Work." Wesbrook. Twelfth Biennial Report of Iowa State Board of Health. Also Proceedings Iowa State Medical Society, 1903.

11. "Coordinated Specialism in Public Health Work." Wesbrook. Presidential address, American Public Health Association, Boston, September, 1905.

Commissioner Porter—I think we owe Dr. Wesbrook a vote of thanks for his very admirable and practical paper. We may learn hastily, from an immediate judgment on his paper, at least two of the factors that have contributed to successful results in Minnesota. First, promptness, and, secondly, experienced men. There is another fact that most of us know, but which may be somewhat strange to our friends from other States, and that is that the con-

tinuance of the greatness of New York is due to her modesty, which is pervasive and prevailing. New York's modesty leads her to invite distinguished citizens from other States to give her advice and when she has received that advice her wisdom leads her, if it be good, to adopt it. Therefore, whatever may be good—(and it was all good)—in Dr. Wesbrook's address we shall adopt, and of course by its adoption New York will remain the Empire State.

We come now to the next paper on the program, by Dr. Richard M. Pearce, Director Bender Hygienic Laboratory of Albany, N. Y., on the "Pathology of Diphtheria." (Applause).

PAPER.

Pathology of Diphtheria (illustrated with lantern slides). Dr. Richard M. Pearce, Director Bender Hygienic Laboratory, Albany, N. Y.

Dr. Pearce did not read a prepared paper. Instead he showed a number of interesting lantern slides, which he explained. While the lecture was intensely interesting and instructive, it would not be intelligible without the slides and therefore is not published.

At the conclusion of Dr. Pearce's remarks, Commissioner Porter declared the meeting of the Conference adjourned until Thursday morning at 9:30 A. M.

THURSDAY, OCTOBER 5, 1905.

THIRD SESSION, 9.30 A. M.

Commissioner Porter—I think we are to be congratulated not only upon our large attendance, which is the largest the Conference has ever had, I am told, but upon the smiling skies that greeted our appearance at the Capitol. I would like to ask those who have not as yet registered to do so. We will take an adjournment this morning at half-past eleven and take the train at one o'clock for Saratoga, to inspect the sewage disposal plant.

It gives me pleasure to announce to you that your presiding officer this forenoon will be Dr. Hix, of Binghamton, who will now take the chair.

Chairman Hix—GENTLEMEN OF THE CONFERENCE: It is indeed an honor to be designated to preside over your deliberations this morning; an honor I very much appreciate. I did not expect to be called upon to fill this place, but the pleasure this morning for myself and for each one who is interested in this Conference, is the fact that I can introduce to you one of the leaders in sanitation in this State, and in the whole United States; one of the first men that ever dared step out and say that contagious diseases can be and should be prevented, and one of the first to demonstrate to the public the fact that such was the case. We all should be thankful for this opportunity, and it is with great pleasure that I introduce to you this morning Dr. John S. Fulton, Secretary of the State Board of Health of Maryland, who will address you this morning on "Statistical Studies of Pneumonia and Typhoid Fever." (Applause.)

ADDRESS BY DR. JOHN S. FULTON,

Secretary, State Board of Health of Maryland, Baltimore, Md.

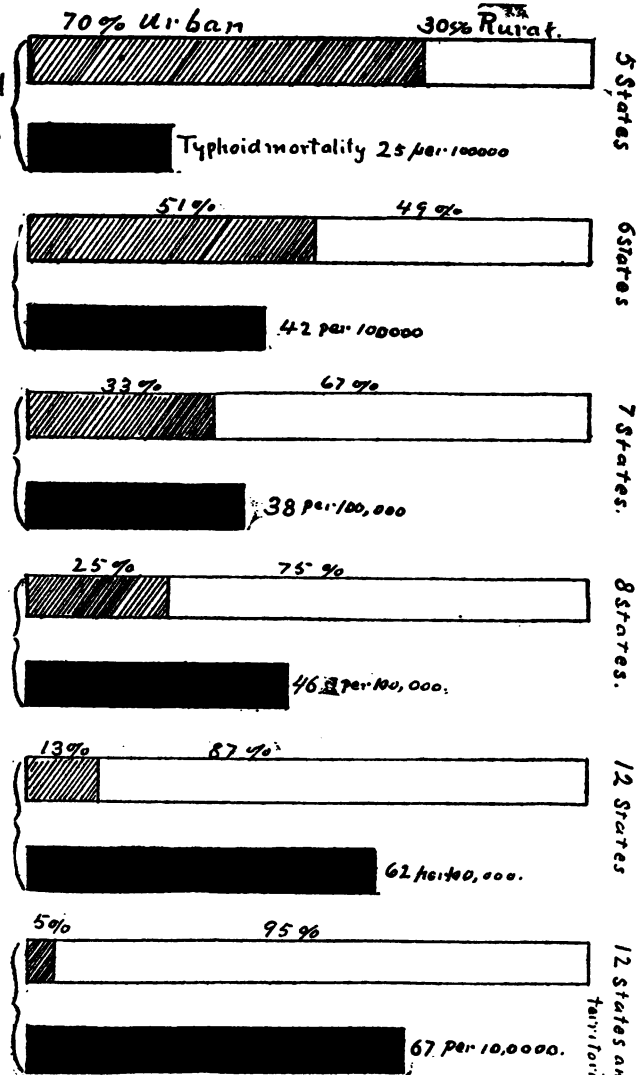
STATISTICAL STUDIES OF PNEUMONIA AND TYPHOID FEVER.

MR. CHAIRMAN AND LADIES AND GENTLEMEN—Dr. Porter asked me some months ago to come and speak to the Conference of Sanitary Officers of this State, and was kind enough to relieve me of responsibility as to what I should talk about, by telling me on what subject I should speak. It was an invitation that I accepted with great pleasure; for two reasons. The first is that I appeared here once before and became interested in this movement in New York to assemble the local health officers once a year for consultation in sanitary matters, and the second is, that we in Maryland owe a considerable debt to New York State. When we have things going on down there in which we want outside advice—and we very frequently have such things—there is no state to which we turn with more certainty of getting the

assistance we ask for than to New York State. So in appearing here this morning I consider that I am but discharging a small part of the obligation which we acknowledge to the State of New York.

The subject about which I am to talk to you this morning, dealing largely with figures, probably does not fill you with pleasant anticipations; but I think if health officers would approach the subject of statistics without the preconception that the exercise will be rigorous, they might find themselves deeply interested—at any rate that is my experience. The mathematics which one needs in order to be a fairly good statistician is no great matter. Plain mathematics and plain logic will, I think, meet the needs of a health officer. Dr. Porter asked me to talk to you about two diseases, typhoid fever and pneumonia. I consider it a very happy choice, because one of these diseases is most prevalent under rural conditions, and the other prevails most under the conditions of city life.

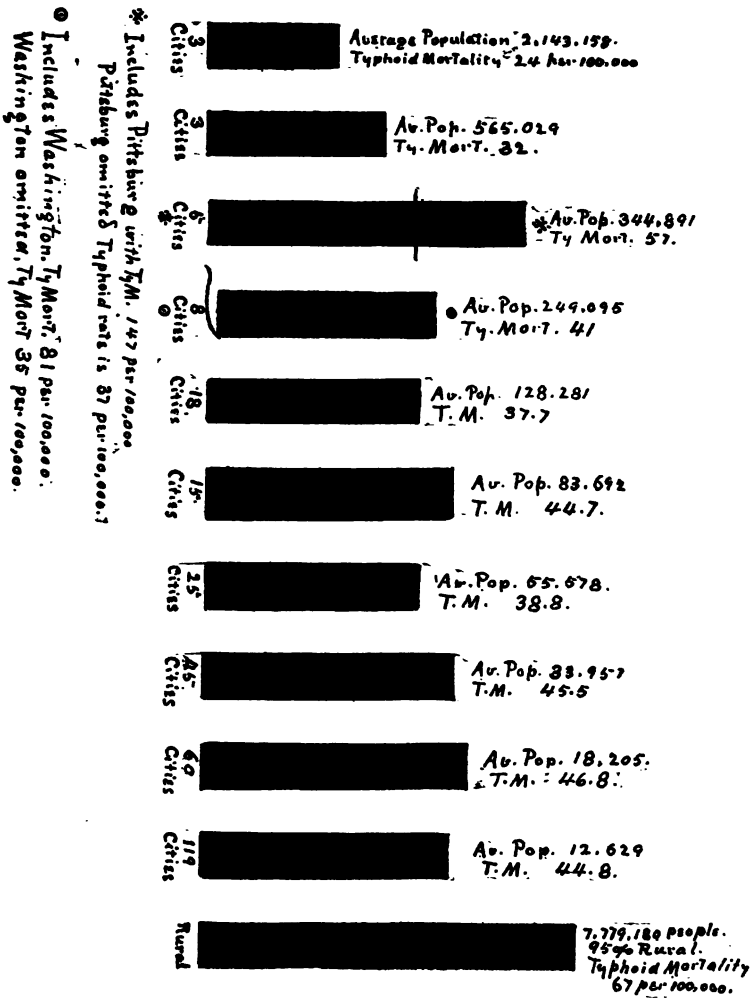
First, I shall speak about typhoid fever. In 1878, a very distinguished gentleman of New York, whom all of you will remember and whom many of you perhaps knew, Col. Geo. Waring, wrote a book on sewerage and land drainage, in which he made this remark: "The progress of typhoid fever is in general from the country to the town, and not from the town to the country." There was no medical opinion at that time to support his view, nor has there been down to within the last two or three years. That was his observation as a sanitary engineer. The prevailing ideas concerning the epidemiology of typhoid fever rest on the experience of cities. Wherever people are close together in large communities the demonstrations of typhoid fever are always very striking; but when it appears under rural conditions, typhoid fever cannot make such striking demonstrations, although it may be more prevalent. The statistics of typhoid fever, as found in the Reports of the Twelfth Census, 1900, show that the largest amount of typhoid fever in the United States falls on communities which are more than 90 per cent. rural, in other words, those states of whose population 90 per cent. or more live under rural conditions lose about 67 per hundred thousand of their inhabitants from typhoid fever. In states like North Carolina, Mississippi, the Dakotas, Arkansas, New Mexico, Nevada and Idaho, the populations are less than 10 per cent. urban, and these give a typhoid mortality of about 67 per hundred thousand. At the other end of the scale, we find the states



The States classified on a descending scale of population density. Showing typhoid mortality increasing as rural conditions more and more prevail. White columns indicate rural population; shaded columns urban population; black columns indicate typhoid mortality.

of Massachusetts, Rhode Island, New York, New Jersey, whose populations are 60 per cent. urban, and here the typhoid mortality is 25 per hundred thousand. In the same way with the cities; the popular impression that the larger and more densely populated cities have the highest mortality is wholly erroneous. The three largest cities in the country, New York, Philadelphia and Chicago, only lose 24 per hundred thousand of their population on account of typhoid fever, and if one classifies the cities of this country on a descending scale of population, one finds that the mortality from typhoid fever increases until you reach the cities having an average population of about 12,000, and in these cities the typhoid mortality is 44-8/10 per hundred thousand.

The chart which I show you will convince you, I think, that as you go up in the scale of population you go down in the scale of typhoid mortality. It will perhaps be of interest to you to learn how prevalent in the United States is the delusion that malaria is an important cause of death. It is extremely wide spread—the delusion I mean, not the mortality. Our present location, Albany, is in the midst of an area which is as free from malaria as any in the United States, and yet this part of New York reports every year some mortality from malarial fever. There is absolutely no ground for the belief that anybody dies in this part of New York with malarial fever. Perhaps the delusion is not very prevalent hereabouts, but apparently it exists everywhere. In Maryland, a considerable number of deaths are charged to malaria, although malaria does not, in fact, kill more than one or two persons in two or three years. The deaths from malaria which occur in Maryland, happen to sailors arriving from the Tropics. I have here a few charts in which the malarial and typhoid mortalities are drawn to the same scale, one before, the other for the year 1900. The black areas represent typhoid mortality, and the shaded area represents the alleged mortality from malaria. Each of these charts includes contiguous sections of several states; what the Census Bureau calls a Grand Group. A Grand Group means those parts of two or more contiguous states which present certain physiographic features. Political geography is ignored in these charts. The State of New York enters into six of these so-called Grand Groups, and you will find that a malarial mortality is reported in everyone of these groups. Central New York is probably as free from the malarial delusion as any other part of the United States. I only call your attention to two of the charts which include portions of the State of New



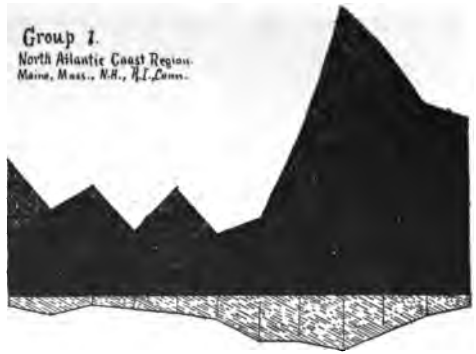
* Includes Pittsburg with Ty. M. 147 per 100,000
Pittsburg omitted Typhoid rate is 87 per 100,000.

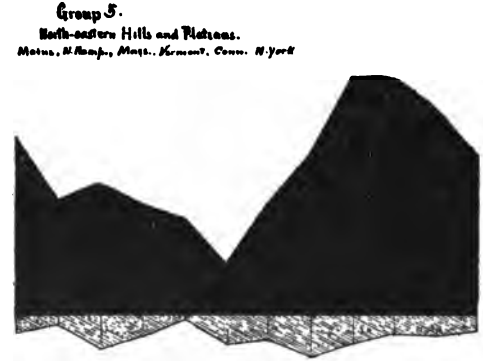
● Includes Washington. Ty. Mort. 81 per 100,000.
Washington omitted. Ty. Mort 35 per 100,000.

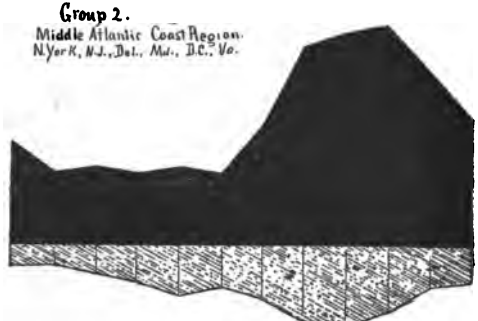
York, one representing the Middle Atlantic Coast Region, and the other representing the Central Apalachian Region.

Let us glance at a Grand Group where there is some excuse for reporting a malarial mortality, a locality where there is much sickness, and some mortality from malaria. The South Mississippi River belt, the Gulf Coast Region, and the Southern Interior Plateau, offer these conditions; and here we will find that 2½ to 3 deaths are attributed to malaria, for one death attributed to typhoid fever. That is nonsense; they don't die in any such proportion. Please note the changes of direction of these lines. A change of direction means a month of time, and in a year there are twelve changes of direction. Observe how perfectly typhoid and malaria obey each other. They reach their high points in the same month, and they then decline together in the earlier part of the year. The seasonal relations of malaria and typhoid fever are not so nearly alike as to make their separate curves correspond anything near so nicely as these curves do. The exhibit simply means that of the deaths which are ascribed to malaria, very many, at least half, were in fact, due to typhoid fever.

I said that I would speak also about pneumonia, which is peculiarly a disease of cities. Its mode of spread is rather strictly localized. It is a very interesting disease at this time, because medical men have generally assented to the view that pneumonia has tremendously increased in the last few years. If pneumonia has increased, it is very important for us to know whereabouts among our people the increased mortality has fallen. First of all, we want to know on what ages the mortality has fallen. Here are two charts taken from the United States census reports for 1890 and for 1900. These charts show that pneumonia has increased at ages below 5 years, that it has diminished between the ages of 5 and 65 years, and at ages above 65 again it has increased slightly. This fact was brought out by Dr. Arnold Klebs, of Chicago, 3 or 4 years ago. He took as his youngest age, the period of life below 15, but these charts show that the increase belongs to the still smaller period of life below the age of 5 years. This narrows down our inquiry to the pneumonias occurring in very early life and in old age. The increase above the age of 65 is very nearly explained by the more advanced age of the living in 1900 as compared with 1890 and 1880. These same census figures show that deaths from old age have decreased materially between 1880 and 1900, although the proportion of the people


Group 1.
North Atlantic Coast Region.
Maine, Mass., N.H., R.I., Conn.

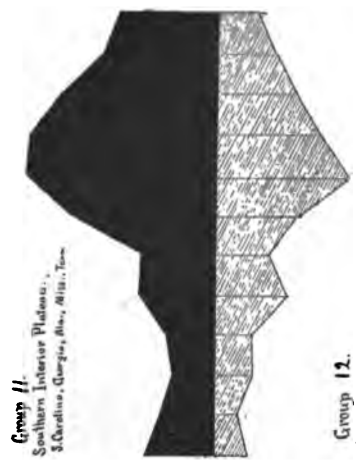

Group 5.
North-eastern Hills and Plateaus.
Maine, N.Hamp., Mass., Vermont, Conn. N.York

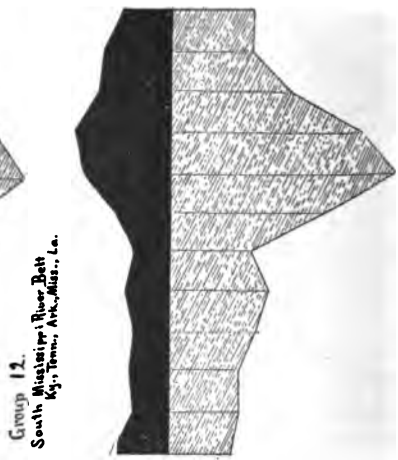

Group 2.
Middle Atlantic Coast Region.
N.York, N.J., Del., Md., D.C., Va.


Group 6.
Central Appalachian Region.
N.York. Pa., N.J., Md.


Group 15.
Central Region: Plains and Prairies.


Group 16.
Prairie Region.


Group 11.
Southern Interior Plateau.
S.Carolina, Georgia, Ala., Miss., Tenn.


Group 12.
South Mississippi River Belt
Ky., Tenn., Ark., Miss., La.

reaching advanced life is greater. Why should the item of old age be disappearing from the tables when the number of individuals living to advanced age is increasing? Simply because better diagnosis is made in these days than twenty years ago, and deaths which were formerly attributed to "old age" are now attributed to definite diseases, as Bright's disease, heart disease, and pneumonia. The increase of pneumonia, above the age of 60, is too small to be worthy of consideration, if indeed it does not wholly disappear when allowance is made for increased population at those ages and for improving medical diagnosis.

That part of human life to which our inquiry is confined is the period of life below the age of 5 years. Registrars of vital statistics always have a large mortality account charged up to unknown causes. In the past twenty years this account has been declining all over the country. Why should this account decline? Because better diagnosis being made and the supply of physicians being larger, fewer deaths than formerly are ascribed to unknown causes, and more deaths are attributable to the more definite causes, of which pneumonia is one. If you examine the unknown causes in the statistical reports you will find that a very great majority of the deaths which are ascribed to unknown causes happen to children under 5 years of age. A great many definite causes of mortality have probably been increased by this circumstance, but a majority of the diseases of children are manifestly declining. The disappearance of vague causes of death and unknown causes of death would tend to exaggerate the increase of diseases whose mortality appears to be rising, and pneumonia is about the only disease, destroying children under the age of 5 years, which seems to be on the increase. The diarrheal diseases, and diphtheria, and scarlet fever are nothing like so fatal now as formerly. Pneumonia alone, among the diseases of infants, seems to be increasing.

Let us take another indefinite cause of death which may disguise an existing pneumonia and see how that is progressing. "Convulsions" have always figured largely in the mortality statistics for young children, but the mortality from convulsions has been steadily declining in the United States ever since 1870. Of the total mortality attributed to convulsions, nearly all belongs to the period of life under 5 years. In children convulsions very often occur with the onset of pneumonia. They disguise the disease, but they do not deceive the physician so often now as formerly. Recollect that instruction in the diseases of children

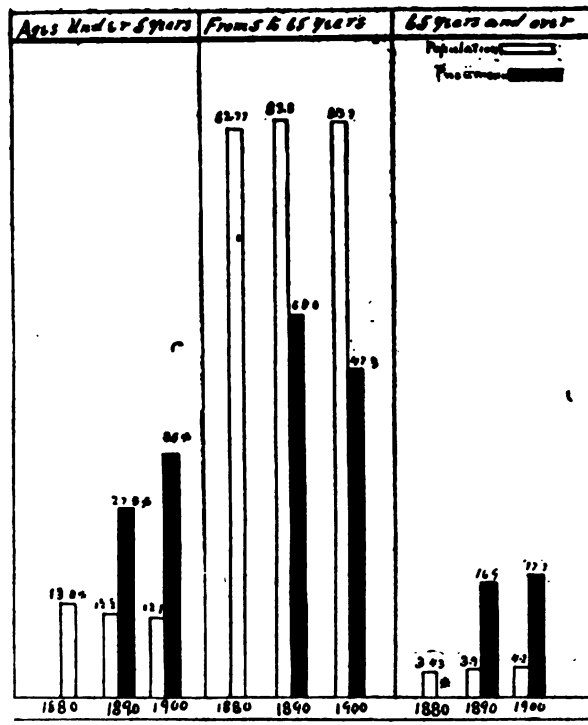


Chart 1.—United States census figures for 1880, 1890 and 1900. Population percentage in 3 age periods. Pneumonia mortality percentage in 3 age periods. *Pneumonia for 1880 unknown.

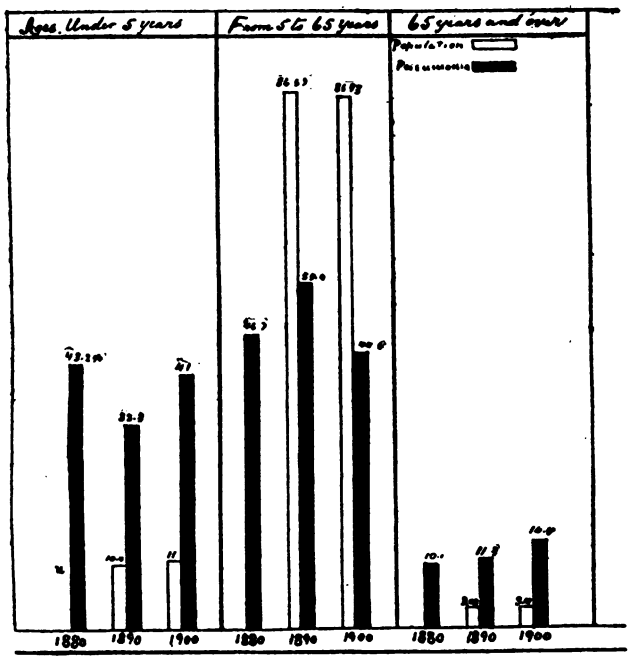


Chart 2.—United States Census, 1880, 1890, 1900. Percentages of urban population in 3 age periods. Percentages of urban pneumonia mortality in 3 age periods. Urban population for 1880 unknown.

was not included in the courses of study in medical schools until very recently, and the diagnosis of pneumonia in children is a very modern refinement of medicine.

Here is a chart which shows how the mortality from "convulsions" and the mortality from pneumonia go up and down together year after year, but tending always to get further apart. This chart is from the experience of Connecticut, and a glance at it, I should think, would suffice to show you that the convulsions account is being unloaded into the pneumonia account. It would be possible to show you a great many charts from various states showing exactly the same thing.

It is a very vague kind of statement to say that convulsions have caused death in any case. Registrars are however, in the habit of classifying convulsions among the nervous diseases, just as they class pneumonia among the respiratory diseases. The State Board of Health of New Jersey has for many years kept separate accounts for all the brain and nervous diseases of children, and for the acute lung diseases. Pneumonia, of course, is the most important of the acute lung diseases, and "convulsions" are more than half of all the so-called brain and nervous diseases of children. On this chart you see the behavior of "acute lung diseases" and "brain and nervous diseases of children" in New Jersey. They go up and down together, but they get further and further apart. If this chart means anything, it means that the "brain and nervous diseases of children" have been for twenty odd years unloading more and more every year into the "acute lung diseases." A great many vague diseases of early life are declining in somewhat the same way that convulsions seem to decline. For instance, in Massachusetts, "teething" and "worms" used to be credited with a certain number of deaths every year, but with improving diagnosis such absurd causes of death have wholly disappeared from the statistics.

Now one may ask the question; is pneumonia itself a definite cause of death? The answer is that the word pneumonia does not express a definite pathology, and that it is particularly indefinite when applied to diseases of early life and to the diseases of old age. In comparatively recent times medical men have learned to recognize a kind of pneumonia called bronchopneumonia. All the American statistics for pneumonia down to this very moment include the mortality from bronchopneumonia. Unless one has access to the original records it is practically impossible to discover how much of the so called pneumonia mortality was returned

Chart 4.—Connecticut. Showing history of unknown causes. Illustrating the confusion between convulsions and pneumonia. Tendency to diverge in parallel motion. Relation of influenza suddenly appearing in 1890. Unknown causes are included in these ratios.

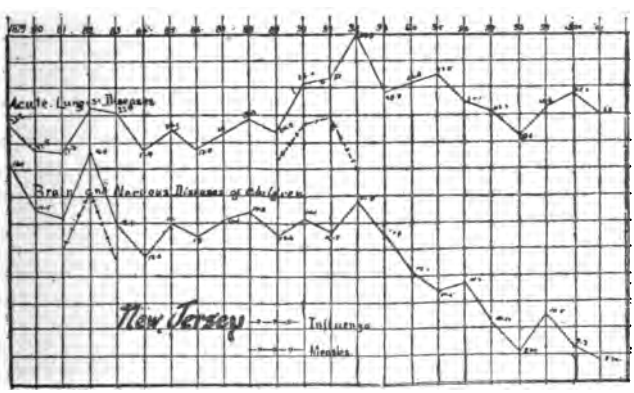


Chart 10.—New Jersey. Showing the mortality account of brain and nervous diseases of children unloading into the mortality account of acute lung diseases. The chart of 1892 suggests marked alteration either in the death certification or statistical treatment of influenza.

on the death certificates as pneumonia, and how much was returned on the death certificates as bronchopneumonia. The statistics of one or two cities, New York and Boston, for instance, show that in Boston 47 per cent. and in New York 75 per cent. of the pneumonia account for all ages was returned on the death certificates as bronchopneumonia.

Autopsy statistics show that of the pneumonias occurring under 5 years more than 96.2 per cent. are bronchopneumonias. Recollect that bronchopneumonia is a secondary or complicating disease, that it follows usually some other affection, as measles, whooping cough, or influenza, and you will see that an increase in the bronchopneumonia account signifies nothing whatever with reference to the true pneumonia account. Think further about the habits of physicians in certifying deaths. In the certificate, as in ordinary conversation, a physician often uses the word "pneumonia" when he means "bronchopneumonia," but he never uses the word "bronchopneumonia" when he means lobar pneumonia. Taken altogether, these circumstances seem to me to show that the testimony of the death certificate, as to any increase of pneumonia below the age of 5 years is worth very little, if indeed it is worth anything.

It is a pity, I think, that we cannot study the mortality statistics of cities as carefully as the mortality statistics of states can be studied. One can find however, very remarkable fallacies here and there in the statistics published by one of the great American cities; I mean Chicago. For instance, in one of the Chicago bulletins about a year ago, we were told that the mortality from all causes under the age of 5 years, was at that time 21.8 per cent. of the total mortality. At the same time Chicago proclaimed that pneumonia was furnishing 22.32 per cent. of her whole mortality. Now the experience of the United States shows that nowhere less than 37 per cent. of the pneumonia mortality happens under the age of 5 years, and in cities 46 per cent. or over of the pneumonia mortality happens under the age of 5 years. Chicago's statistics would therefore work out this way:

In 1,000 deaths at all ages there are 218 deaths under 5 years.

In 1,000 deaths from all causes there are 223.2 deaths from pneumonia.

In 223.2 deaths from pneumonia there are $223.2 \times .37 = 82.58$ deaths from pneumonia under 5;

Or $223.2 \times .46 = 102.67$ deaths from pneumonia under 5.

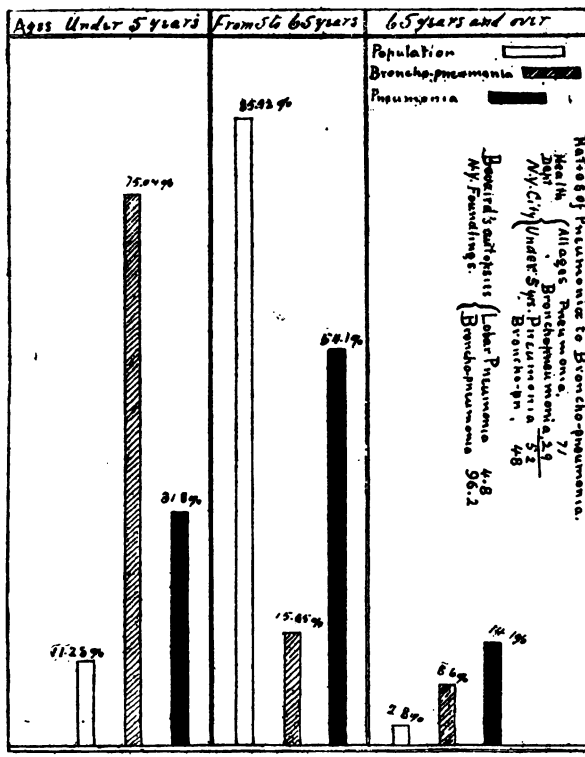


Chart 12.—New York City, 1901. Percentages of population in 3 age periods. Percentages of pneumonia mortality in 3 age periods. Percentages of bronchopneumonia in 3 age periods.

In 1,000 deaths under 5 there are $\frac{82.58 \times 1000}{218}$ =379 deaths from pneumonia;

Or $\frac{12.067 \times 1000}{218}$ =471 deaths from pneumonia.

If Chicago's statistics are true, every second or third death of a child under 5 years of age must have been certified as due to pneumonia. The diarrheal diseases must, in that event, have shrunk to proportions altogether unprecedented in the history of the world, and the other causes of infant mortality must be out of business altogether. Since the pneumonia mortality has very striking seasonal relations, its harvest being practically completed in five months of the year, the Chicago statistics would indicate that, between December 1st and April 30th, something like 80 per cent. of the certificates of death of children under five are charged to the pneumonia account. To my mind, the Chicago pneumonia statistics exhaust the possibilities of credibility, unless Chicago can show that her current mortality violates all the rules which seem to govern current mortality elsewhere. From this study one should not conclude that pneumonia is a comparatively unimportant cause of death, but we may conclude that its increase, if it has increased, is tremendously exaggerated by the statistics. We may conclude also that the secondary or bronchopneumonias are far more important than they were formerly considered; that these secondary pneumonias have derived much of their importance from the prevalence of influenza in this country since 1889; that the respiratory diseases of childhood are of great interest to sanitarians, especially since 1889; and that the diminishing incidence of pneumonia on the middle periods of life, notwithstanding the annual epidemic of influenza, should make us on the whole hopeful with regard to the future of acute lobar pneumonia.

Chairman Hix—Now, gentlemen, there is very little time, and I think it is due to Dr. Fulton that I should express on behalf of this Conference our appreciation of this able paper and that this expression be in fact a vote of thanks to this gentleman for making such an effort to benefit us. The papers will be discussed together. So I will with great satisfaction introduce to you one of the leaders in bacteriological work in this country, a man who has been an inspiration to the health officers who have availed themselves of the privilege of visiting him and his work, as has been my pleasure.

I now introduce to you Dr. William H. Park, Director of the Bacteriological Laboratory, Department of Health, New York City, who will now address you on the subject of "Status of Pneumonia and Cerebro-Spinal Meningitis as Contagious Diseases." (Applause.)

ADDRESS BY DR. WM. H. PARK,

Director Research Laboratory, Department of Health, City of New York.

The Communicability of Pneumonia and Cerebro-spinal Meningitis.

During the past year investigations have been carried out in New York city upon these diseases which have yielded some interesting facts. The manner in which the investigations were carried out was in itself peculiar. Two commissions were established, one to study pneumonia and one to study cerebro-spinal meningitis. For the first the city appropriated $10,000 and for the second, $5,000. The work upon pneumonia was divided into a bacteriological and a chemical portion. The committee members were selected from Chicago, Philadelphia, Boston and Baltimore and New York. In this way no accidental conditions in one city would endanger a one-sided study. The Medical Commission for the study of cerebro-spinal meningitis was appointed in a similar way except that all the members were New Yorkers. New York city being the only city in which the disease was prevalent, made it seem wise to confine the investigation to New York for the present at least. The bacteriological portion of the work of the pneumonia commission has just been published and can be obtained by writing to the City Department of Health.

The results obtained by the different workers were in essentials alike. All of us found pneumococci to be present during the winter months in the throat secretions of a large percentage of healthy individuals in both the city and the country. The country cases were selected from farms, small hamlets and from villages in the mountains. In the Research Laboratory we found that pneumococci were slightly more virulent for rabbits and mice when taken from cases of pneumonia than when taken from healthy throats and that those from healthy throats in winter were much more virulent than from healthy throats in summer. In summer and fall pneumococci were only obtained from about twenty instead of about 70 per cent of healthy persons. Both the chemical and bacteriological findings indicate that most cases of

pneumonia develop after exposure or other deleterious influence because of the pneumococci already present in the throat. The seed is present and only waits for the preparation of the soil. The fact that pneumococci obtained from pneumonia cases are the most virulent and that those obtained from healthy throats in winter are more virulent on the average than those from healthy throats in summer suggests very strongly that the more virulent pneumococci in the throats in winter have been derived from those who have had severe colds or pneumonia. Measures to prevent dissemination of pneumococci, influenza bacilli, etc., such as the prevention of expectoration on floors and sidewalks are certainly very necessary. I firmly believe that if no pneumococci were spread to healthy persons from those having respiratory diseases there would be far less acute respiratory diseases in winter and spring than now occurs.

The report of the meningitis commission has not as yet been published and I can only give you the results obtained in the part of the work carried on in the Research Laboratory of the Department of Health. We confined our investigation to the question of communicability. Dr. Boldman paid especial attention to the investigation of the conditions at the homes while Dr. Goodwin examined the nasal discharges of those sick with meningitis and also of those in very close attendance on them. Dr. Boldman found in 200 out of 1,500 consecutive cases a history suggesting that the disease was communicable. One hundred and forty-four of these were carefully examined. These 44 cases were located in 58 groups, as follows:

39	instances	with	2	cases	to	a	house	.....	78 cases
15	"	"	3	"	"	"		.....	45 "
2	"	"	3	"	"	"		.....	8 "
1	instance	with	5	"	"	"		.....	5 "
1	"	"	8	"	"	"		.....	8 "
58									144

A few only of these groups can be given here, but those mentioned are representative of the others. The last nine consecutive groups gave the following histories:

50. In 75 Baxter street, an Italian family, B——, living on the fifth floor of a large tenement had a baby, aged eight months, sick of cerebro-spinal meningitis. Eleven days after the onset the baby's brother, eight years old, developed the disease and died in

two days. On the seventh floor of this tenement lives another Italian family, C——. Their baby, one year old was taken sick with cerebro-spinal meningitis about three weeks after the B—— boy had died and while the B—— baby was still sick in the house. The Capelli baby died in a week. There are other children in both families and they all play together.

51. In 13 Little West 12th street, Mrs. F—— had her four children all stricken with cerebro-spinal meningitis within a few days. All of them were at once sent to St. Mary's Hospital. Two of them died, one March 9, the other, March 11. On the death of her two children Mrs. F—— visited with a family, D—— living on the floor below and cried a great deal as she related her story to Mrs. D——. Five weeks after the last child had been taken to the hospital and about the same time since Mrs. F——'s visit just mentioned, the D—— baby developed cerebro-spinal meningitis. The following day the five year old boy was taken sick and three days later two more developed the disease. Three of these have died. There is considerable intercourse between the families.

At the time these facts were elicited, four days after the last of Mrs. D——'s children had been sent to the hospital, nasal swabs were taken from both Mr. and Mrs. D——. Both were found loaded with meningococci.

52. At 517 West 46th street, a young man, A—— developed cerebro-spinal meningitis suddenly after playing ball in Central Park. He was treated at home for four days and then sent to Roosevelt Hospital, where he died in two days. During his stay at home he had been nursed by his mother, Mrs. R——. She developed the disease five days after the boy's removal to the hospital, and died in two days. Interval between cases, five days.

53. At 428 West 37th street, Kate D—— developed cerebro-spinal meningitis on March 30, and was removed to the hospital the next day. Her baby brother, thirteen months old, was taken sick eleven days after this and died in one day. Intervals between cases eleven days.

54. At 158 West 28th street, a boy two and one half years old, the child of a fruit pedler, M——, developed cerebro-spinal meningitis. He was sick only one day and died, March 29. Five days later two other children were taken sick. One of these has completely recovered, the other is still living in the hospital. Interval between first and second cases five days. A nasal swab taken from Mrs. M—— fourteen days after the children were sent to the hospital showed very many meningococci. Swabs made

from the other children and from the convalescent case were negative.

55. In 86 Horatio street, Mary M——, aged six was taken ill with cerebro-spinal meningitis on Christmas Eve. She was sick for about two months and recovered, although deafness resulted. A week after the onset, the girl's aunt, Elizabeth F., who lived in the same apartment and had nursed the girl, developed the disease and died after an illness of one week. Two weeks after the funeral of the aunt and while the first case was still in the house, a little baby sister of this first case became ill. She died after an illness of five weeks, during which time she had many convulsions and high fever. (The attending physicians said she died of convulsions due to teething and that she did not have cerebro-spinal meningitis.)

56. At 131 Thompson street, a boy, eleven years old, developed cerebro-spinal meningitis and died in twenty-four hours. Two months after this, two other children living in this apartment, one a brother, A——, aged six, the other a cousin, G——, aged four, of the first case, became ill. Both died after an illness of three or four days. Interval two months.

57. At 515 East 12th street, John E——, two years old, was taken sick the beginning of March. Three weeks later while the first case was still alive in the house, his brother (eight months), Andrew, developed the disease. Both died about ten days ago (about April 7).

58. At 307 East 45th street, an Italian family, S——, have a girl aged three and one-half, sick for the past two months with cerebro-spinal meningitis. A month after the onset the two year old boy in the family, P——, living on the floor above, developed the disease. Both patients still sick. There are other children in both families, but these are not ill.

The fact that nearly ten per cent. of 1,500 consecutive cases gave positive histories of infection from previous cases is sufficient, I think, to make us accept as a fact that under certain conditions the disease is certainly transmitted from one to another. The bacteriological examinations made previous to our work have revealed in ten cases meningococci in the nasal secretion of meningitis cases.

Dr. Goodwin isolated undoubted meningococci from twelve out of twenty-two cases examined during the first week and from five out of fifteen examined during the second week. No cultures were obtained from the six examined during the third week, but one was

obtained from a case on the 67th day. In the early cases, when present, the meningococci usually existed in great numbers. Of great interest was the finding of meningococci in five out of forty-five healthy persons nursing the meningitis cases under tenement house conditions. The meningococci were plentiful in all five and very abundant in three. In fifty medical students no characteristic meningococci were found. The bacteriological findings are seen to explain the transmission of disease transmitted from one case to another. The meningococci are present usually only during the first two weeks of the disease and an isolation of the patient for that period of time would probably be sufficient. When present in the nasal secretion of those nursing the sick they remain for only a short period of time.

It might well be asked why more cases are not infected. There are at least two reasons: It is not enough that infection of the nasal mucous membrane takes place, infection of the meninges must also occur. Here not only local but general peculiarities of person come into play. The points that seem certain are that epidemic cerebro-spinal meningitis is almost invariably due to the meningococci and that these are present in the nasal secretion of the majority of persons sick with meningitis during the first two weeks of the disease and in about ten per cent. of those actually nursing them when no precautions are taken to avoid infection. New York city has determined to isolate cases of meningitis during the first two weeks of illness and possibly for longer periods. The same precautions are used as in diphtheria.

Chairman Hix—We have just a few minutes for discussing these papers. Now, these papers demonstrate the great benefit to us of sanitarians and bacteriologists, and that they are of the utmost importance to our work as we know more and more the good they can do. If you have any questions, or wish to discuss in any manner either of these papers of Dr. Fulton or Dr. Parks now is your opportunity. We have a few minutes and have plenty of time for the other paper, if there is some point that has not been brought out to your satisfaction.

If there is no question to be asked in regard to these papers, and I acknowledge the field has been well and completely covered, I take pleasure in introducing to you the director of the Antitoxin Laboratory, one who has been very kind to all of us and aided us in our work, Dr. H. D. Pease, Director of the Antitoxin Laboratory of the State Department of Health, who will now address you. (Applause.)

ADDRESS BY DR. H. D. PEASE,

Director Antitoxin Laboratory, New York State Department of Health.

Some Isolated Outbreaks of Cerebro-spinal Meningitis in New York State.

Mr. Chairman and Members: It is not my intention to enter into any detailed consideration of the literature on the subject of the communicability of cerebrospinal meningitis. Dr. Park has fully covered that aspect of the subject. Nor am I able to present to you the results of a series of investigations which have been fully worked out from both the bacteriological and clinical standpoints, as have been those presented by Dr. Park. The conditions surrounding the outbreaks of cerebrospinal meningitis which I shall bring to your attention were such that if a full clinical and bacteriological investigation had been possible, the results would have been of the very greatest value. As it is they are most suggestive, and in a large measure substantiate the conclusions drawn by Dr. Park.

The attention of the New York State Department of Health was called to an unusual outbreak of the disease by Dr. George Huntington of Hopewell Junction, N. Y. The following is a brief outline of the cases: The first patient was the owner and bartender in a saloon located close to the railroad junction and station. The onset of the disease occurred on September 24th after a period of hard drinking, and he died within twenty-four hours. The second case was in the person of a railroad fireman who had frequented the saloon owned by the first patient. This patient developed the disease on September 26th and died on the fourth day thereafter.

The third case developed shortly after the death of the first, and was in the person of a regular boarder at the house of the first patient. He was removed to his home, some four miles away, where he died. About October 1st the six months old child of the first patient developed the disease in a mild form and recovered. An aunt of this child on returning to her home, many miles away, after nursing the child, also developed the disease, but finally recovered after a prolonged attack.

The bedding and bedroom furniture of the room occupied by the first patient were sold at auction after airing, and used by others in the village. On November 2d a boy, six years of age, was attacked by the disease and died the following day. He had associated with the members of the family of the first patient. On November 25th the young nephew of the first patient who had been in contact with that case and his family began to show symptoms of the disease, and died within a few hours of the onset.

No cases other than these had been present or occurred in that section of the country until five months later when two occurred. These cases could not be traced in any way to the previous series.

There was no question as to the clinical diagnosis in these cases, although no bacteriological examinations of the nasal secretions or cerebrospinal fluid were made.

Through Dr. Stanton Curry of Peekskill I was able to learn a few facts concerning the occurrence of the disease in four members of one family, the mother and three children, living in Croton-on-the-Hudson. The mother's attack developed subsequent to those of one or more of the children, and she was brought to the Peekskill Hospital. I have been unable to obtain any further information concerning the time, course and termination of the disease in the children, but the mother had cerebrospinal meningitis without question, and died from it.

I am indebted to Drs. H. T. Kurtz and G. W. Blanchard of Highland Falls for the histories of two children, brother and sister, who were the only persons to have the disease in that locality. The children's grandmother returned home after spending the winter in Waterbury, Conn., where the disease was prevalent. She brought clothing for the children. The sister developed the disease four days after its onset in the brother. The diagnosis of cerebrospinal meningitis was undoubtedly correct in both instances. These cases were closely quarantined.

Through Dr. S. A. Holcomb of Palenville I obtained the histories of three cases, which were the only cases occurring in the small village of Kiskatom near Catskill. The first two patients were brothers, and the third was their nurse. The disease developed on the 20th, 23d and 25th of March respectively. The diagnosis is unquestionable from a clinical standpoint.

Dr. W. L. Wilson of Scotia reported the occurrence of three cases of the disease in one family at that place. The disease also occurred in that village in one or two other isolated instances

not connected, so far as known, with the first series. These three cases developed on the 16th, 18th and 22d of February. The autopsy and bacteriological examination confirmed the clinical diagnosis in one of the three cases.

On May 11th a child was sent from its home in Oneida to visit its grandparents in Ilion. On the 13th of May symptoms of cerebro-spinal meningitis developed, and the child died the next day. On the 18th of May another child in the Oneida home developed the disease, and likewise died within twenty-four hours. There were five other cases in the village of Oneida, but they were not known to be connected with either of these other two cases.

In the village of Ransomville near Niagara Falls four cases occurred in one family. The father developed the disease on the 19th of April, the oldest son on the 21st of April a few hours after the father's death, the son's nurse on May 1st, ten days after coming from Niagara Falls to the house, and a younger son on the 4th of May. No other cases occurred before or developed later in that village.

Isolated cases were reported as occurring in several of the smaller cities of the State. Thus the cities of Hudson, Niagara Falls and Rome had but one each, Binghamton three and Peekskill three. In the larger cities the disease was practically epidemic.

The existence of so many series of cases in each of which the contact between the individuals contracting the disease was close, with no other cases occurring in these sections of the country, would seem to strongly indicate the transmission of the infective agent from person to person by such contact.

Such a method of transmission is most strongly indicated by the development of the disease in the two nurses a few days after the commencement of their attendance upon those who were suffering from the disease. If, therefore, transmission by contact is not only possible but probable, the conclusion is warranted that well persons should not unnecessarily come in contact with cases of cerebrospinal meningitis, and that houses in which such cases exist might well be quarantined, especially if the cases in them are not isolated.

In considering the well recognized fact that large numbers of well persons have very commonly come into close contact with cases without contracting the disease, it should not be forgotten that the history of the disease shows clearly that the development of a special susceptibility, usually brought on by physical

or mental strains and excesses or exposures, almost invariably precedes the onset of the attack. The lack of this susceptibility does not preclude the possibility of such persons harboring the meningococcus in their nasal secretions, and thus becoming a menace to other well persons who come in contact with them and who are susceptible. On this ground rests the advisability of quarantining cases of the disease, and those in attendance upon them.

Chairman Hix—Is there any one who wishes to ask Dr. Pease any question?

Mr. McGann—Were any of these cases quarantined, barring the one mentioned as being quarantined? You spoke of several cases and of one case as being quarantined. Were all of the cases quarantined?

Dr. Pease—No, all of the cases were not quarantined. Some of them were quarantined and some were not. The cases at Hopewell Junction were not quarantined.

Mr. McGann—I don't see that the spread was very much greater among those that were not quarantined than among those that were quarantined. The point I want to get at is, whether the quarantine was absolutely necessary?

Dr. Pease—I think the point is fairly well taken. In regions where communication between individual families is not great, where houses are isolated, where people do not mix closely, it is doubtful whether there is the same necessity for as strict a quarantine in cerebrospinal meningitis as there is, for instance, in diphtheria. In closely settled districts I believe a proper quarantine is advisable.

Chairman Hix—Our Commissioner has planned to give us a little excursion through the invitation of the gentleman from Saratoga, who gave us such an excellent address in regard to the plant.

Now, Dr. Moriarta is here and would like to have an opportunity to make some remarks in regard to the plant that will save him many questions probably and cause many of us to be better able to comprehend the plant than we would be without his remarks. (Applause.) I have the pleasure of introducing Dr. Moriarta, who has done so much in this State for the proper sanitary disposal of sewage.

Dr. D. C. Moriarta, of Saratoga Springs—MR. CHAIRMAN AND GENTLEMEN: I am a little bit at a loss to know how to best do what I would like to do. I have a few words I want to say and then I would like to have you men see a few charts I have here, because we have found when people visit our plant they do not quite understand the little details. They are very simple if they are once seen, and they will be able to appreciate it so much the more easily.

ADDRESS BY DR. D. C. MORIARTA.

THE SEWAGE DISPOSAL PLANT AT SARATOGA SPRINGS.

MR. CHAIRMAN AND GENTLEMEN OF THE CONFERENCE—Because you are to visit the sewage disposal plant at Saratoga, it is my pleasure and is the reason for asking your indulgence for a few moments today. So many of our visitors find it difficult entirely to understand the construction of our system and the work done there, that I have deemed it pertinent to give you an insight or preview of what you will find at Saratoga. That you may have an idea of the general construction and special features of our plant, I have had several drawings prepared by our engineer which I shall attempt to explain later. I shall also give a brief resumé of the past year's work, so that those particularly interested in this branch of engineering science can compare our results with those obtained at other plants, as well as those of our own previously reported by me to this conference at our meeting a year ago. I trust you will find the general scheme of our sewage disposal plant interesting. The bacterial results are really wonderful, and the labor-saving devices are novel and reduce the cost of maintenance very materially.

For the benefit of those who are not familiar with our sewage disposal proposition at Saratoga, I will briefly outline what is done there. We take care of from one and one-half to three million gallons of sewage daily; the character of which is essentially a dilute family sewage, free from chemical contamination. This is particularly fortunate, as the chemicals would by their germicidal qualities inhibit bacterial action. Perhaps it would be well for me to emphasize that the entire sludge has been taken care of since the inception of the plant entirely by bacterial action; and that it was established in July, 1903, that it has been in constant use since that time, and that the septic tanks have never been emptied. To those of you familiar with the details of sewage disposal propositions, this will seem almost an exaggeration.

Originally there was an enormous quantity of surface, sepage

and roof water emptying into our sewer system, which had to be diverted because it diluted the sewage, and during the winter months lowered the temperature, thus interfering with the bacterial action and the results. The surface and sepage water has been successfully removed, while much of the roof water still remains, and is very troublesome at the time of heavy rains, not only diluting the sewage and taxing the beds, but it disturbs the contents of the tanks, which then by the increased flow is carried onto the beds.

The sewage at Saratoga is collected by trunk line from many laterals, and runs by gravity about one mile to the pumping station, where we have three centrifugal pumps run by electricity. Here the sewage is lifted 19 feet through a force main to the filter beds. At the filter beds we have four tanks to receive the sewage from the force main, containing a million gallons. The inlet and outlet are so arranged that the top or bottom sewage is not disturbed, the object being to have the greatest bacterial action. From these tanks the sewage passes to the aerator, and then by distributing pipes in the embankment to the beds.

Concerning the beds, and the material which we have been obliged to remove, I said a year ago that we had only removed about two tons of scrapings from the surface of the beds during twelve months. During the present year we have removed considerably more from the beds. This increase, in our judgment, is due to heavy rains, when the roof water stirs up the sludge in the tanks, as mentioned, which passes out and onto the beds. The surface of the beds has only been cleared once of this material, which was in September, and which was then about one third of an inch thick. The relative amount of sludge in tanks is as follows:

August 31, 1904.

	SCUM.			DEPOSIT.		
	Inlet.	Center.	Outlet.	Inlet.	Center.	Outlet.
Tank No. 1	3′ 6″	1′ 6″	4″	8″	6″	4″
Tank No. 2	3′ 6″	2′	4″	6″	6″	4″
Tank No. 3	3′ 6″	2′	4″	8″	6″	4″

August 29, 1905.

Tank No. 1	3′ 6″	2′	4″	1′	10″	6″
Tank No. 2	3′	2′	4″	10″	10″	6″
Tank No. 3	3′	2′	8″	8″	1′	10″

October 2, 1904.

	SCUM.			DEPOSIT.		
	Inlet.	Center.	Outer.	Inlet.	Center.	Outlet.
Tank No. 1	3′ 6″	1′ 6″	4″	9″	6″	4″
Tank No. 2	3′ 6″	1′ 6″	4″	8″	3″	6″
Tank No. 3	3′ 6″	1′ 6″	4″	6″	3″	3″

October 3, 1905.

Tank No. 1	2′ 6″	1′ 2″	4″	10″	8″	4″
Tank No. 2	2′	1′ 6″	4″	10″	8″	10″
Tank No. 3	2′ 6″	1′ 6″	8″	10″	8″	1′ 2″
Tank No. 4	1″	1″	½″	8″	0	0

You will thus observe that an immense quantity of sludge, the entire amount in our sewage of one year, has been taken care of by bacteria.

The next important feature is maintenance. The cost for the past year has been as follows:

Electric power at the pumping station.....	$771 83
Labor of men at pumping station.....	300 00
Maintenance of horse at sewer beds.....	200 00
Salary of caretaker at beds.....	660 00
Extra labor at beds.....	836 35
	$2,768 18

Last year the cost was about $3,500, the difference being in extra labor at the filter beds.

These figures include all preparation of the beds for winter, the removal of the snow from the runways, and any other work necessary because of the season of the year; also the extra care of leveling and cleaning in the spring, in fact all work of every sort incident to our sewage disposal system. I have not made any estimate for wear and tear.

With your indulgence I will go over the drawings I have had prepared, more clearly to illustrate the working of our system.

At the conclusion of his paper, Dr. Moriarta displayed maps and plans of the sewage disposal plant from which he explained in detail the construction and operation of the plant.

Chairman Hix—Now, you understand that we have an intermission for luncheon and then we take the one o'clock train for Saratoga.

A recess was then taken until 8:30 p. m.

THURSDAY, OCTOBER 5, 1905.

FOURTH SESSION 9 P. M.

Commissioner Porter—FELLOW MEMBERS OF THE CONFERENCE: It gives me great pleasure to introduce to you as first speaker of the evening, Mr. George C. Whipple, of New York City, who will speak to you on "The Pollution of Streams and the Natural Agencies of Purification." (Applause.)

ADDRESS BY GEORGE C. WHIPPLE, C. E.

New York City.

THE POLLUTION OF STREAMS AND THE NATURAL AGENCIES OF PURIFICATION.

Indefinite definitions are the cause of more controversies in the scientific world than disputed facts. Disputants who cannot agree as to what the premises are might as well give up the debate. The use of terms which have double meanings confuses rather than enlightens. In studying the present topic we are handicapped from the start; because, strange as it may seem, there are no terms more loosely used in sanitary science than those which relate to the quality of water. "Pure and wholesome water" our lawyers say in their contracts—what does it mean? "Pollution"—what is it? "A river is contaminated"—just what does that imply? "Running water purifies itself"—does that mean that it becomes wholesome? For a generation there has been an almost continuous discussion of the vexed question of the "self-purification of streams." Much of this has been due to honest differences of judgment and of interpretation of scientific data, but on the other hand a good deal of it has been due to a misconception of the elements of the problem.

It is always difficult to adhere to strict definitions when popular words are used in a scientific sense. The very simplicity of the expression "pure water" makes it hard to define—especially so to a chemist who knows that no natural waters are absolutely pure and that at best he can apply the term only in a relative sense.

In order that I may make myself clear, therefore, I desire at the outset to define some of the terms most commonly used in connection with our subject.

In the first place it must be recognized that river waters in a

state of nature vary greatly in purity; some are clear, colorless and sparkling, some are muddy and high colored, some are saline, some are chalybeate, some are sulphurous. Of these various waters part are wholesome, part are not; and their wholesomeness does not depend upon the characteristics just mentioned. In the second place, river waters may receive additions of artificial substances of several classes—those which do not injure its quality in any material or noticeable way, such as common salt or lime; those which injure its appearance or odor or impregnate it with objectionable chemical constituents but which do not tend to make the water disease producing, such as dye stuffs; those which tend to render the water poisonous, as the salts of lead or tin; and those which tend to make the water capable of producing infectious diseases, such as sewage. Of course substances of any of these classes added to water in excessive amounts injure its quality for some uses. In the third place we must recognize in practice as well as in theory that when water produces diseases it does so chiefly by transmitting living organisms or their spores from one human being, or possibly from some animal, to another human being, or animal. In the fourth place it must be remembered that in public water supplies the quality of the water must be considered for industrial uses as well as for drinking. And lastly, the fact must not be overlooked that not all river waters are used for public water supplies and that it is not necessary to maintain in such the same degree of purity as when they are to be used for drinking. In this case the standard is not a hygienic one, but an aesthetic one.

Our ordinary vocabulary applies to objectionable waters such words as *contaminated, polluted, infected, befouled, defiled, tainted, corrupted, stained, impure, soiled, putrid,* etc., while to describe good and generally satisfactory waters we have only the positive words, *pure, safe* and *wholesome.* With so many words in use, either our language is redundant or we are using words carelessly and without regard to their exact meaning. In the following arrangement of definitions I run the risk of contradicting some authorities, but I believe it to be representative of the best current usage and, at any rate, to make for clearness of expression.

EPITHETS ESPECIALLY APPLICABLE TO WATERS IN A NATURAL STATE.

A *stained water* is one which is colored by vegetable extractives from leaves, soil, etc. (The term "colored water" is a better one.)

A *soiled water* is one made dirty by washings from the soil, that is by clay, silt, etc. (The term "turbid" is a better one.)

A *tainted water* is one which has an unpleasant odor due to the decomposition of organic matter, to the presence of algae, etc.

A *putrid water* is one in which the decomposition of organic matter has reached such a degree that all the dissolved oxygen has disappeared and the water become offensive to the sight or smell. (This term is more often applied to polluted waters.)

An *impregnated water* in one which contains chemically dissolved such substances as lime, magnesia, soda, salt, iron, hydrogen sulphide, etc., in quantities sufficient to be objectionable for the purpose for which the water is to be used. (In small quantities the presence of these substances might pass without comment.)

Epithets Applicable to Water With Artificial Substances Admixed.

A *polluted water* is one which has received and still holds the excreta of human beings, or animals, or the waste products of human industry. The word "pollution" may be used as a general term to cover all substances artificially admixed with water. Polluting matter may be divided into that which contaminates and that which merely tends to make the water foul.

A *befouled water* or a defiled water is one which has received and holds matter tending to make it foul, unsightly, or ill-smelling, but which is not of excrementitious origin.

A *contaminated* water is one which has received and holds excrementitious matter, whether from human beings or animals. Such a water does not necessarily contain disease germs, though this must be always considered as possible. (The word contamination is often used as a synonym for pollution and given a more general application, but its restricted meaning seems to serve a more useful purpose.)

An *infected water* is one which actually contains pathogenic bacteria capable of producing disease. Such disease germs are nearly always of excrementitious origin.

A *poisoned water* is one which contains some poisonous chemical substance. (This occurs rarely except in the case of lead.)

It will be seen that river waters may be stained, or soiled, or tainted, and even putrid, and yet not be polluted, while polluted waters need not necessarily be visibly stained or soiled or tainted.

A water may be polluted and yet not be contaminated with sewage or contain disease germs; a water may be contaminated even and yet not actually contain disease germs. (This statement is only tentatively advanced); but a contaminated water is necessarily a polluted water, while an infected water is both polluted and contaminated. A sharp distinction must be made between befouled waters and contaminated waters, as these terms distinctly separate sewage from trade wastes.

Now, what are pure and safe and wholesome waters? The last two have nearly equivalent meanings. A *safe water* may be taken as one which is neither poisonous or infected or contaminated, that is, one which is not liable to cause actual disease.

A *wholesome water* is a safe water and one which is not befouled, stained, soiled or tainted enough to injure the health or to make the water too unattractive to use. Preferably also it should be well aerated.

A *pure water* implies much more; it must not only be not poisonous, not infected, not contaminated and not appreciably befouled, but besides this it must be practically unstained, unsoiled and untainted, as well as unimpregnated with noticeable amounts of objectionable chemical salts. Obviously there may be different degrees of purity, but absence of contamination and practical absence of befoulment must be considered in any case as a *sine qua non.*

Now that we have defined these terms from a sanitarian's point of view let us see how the analyst defines them and what tests can be applied to differentiate them. We cannot go into this subject minutely without consuming too much time, but it should be noted that the tests which make up a water analysis may be divided into four groups—physical, chemical, microscopical and bacteriological—which serve different purposes.

Waters naturally stained, soiled or tainted may be studied by physical tests alone, which can be made out of doors with very simple apparatus, though in studying tainted waters a microscopical examination of the algae, etc., is of great value.

Befouled waters must be studied chemically as well as physically and microscopically. The amount of organic matter, nitrogenous and carbonaceous, must be determined as well as some of the mineral constituents. Sometimes, and especially when the befoulment is large, the dissolved gases, oxygen and carbonic acid, must be determined to see if there is danger of putridity. Bacteriological examinations are also sometimes helpful.

Bacteriological examinations are especially necessary, however, in the study of contamination. Here they are absolutely essential and the tests must be such as to reveal not only the number of ordinary water bacteria but those which are commonly associated with fecal matter and sewage. Among these the test for the colon bacillus is of most value, as the presence of this organism and its relative abundance is the best index of contamination that we have. It is desirable, however, and often necessary to have chemical, physical and microscopical examinations accompany the bacteriological tests. Indeed these four tests are now generally recognized as constituting a modern sanitary water analysis and their testimony should be interlocking, one part helping to explain the other.

Beyond proving a water to be contaminated we cannot go at present with our laboratory methods. We cannot tell by analysis with certainty that a water is or is not actually infected with disease germs. I do not mean that it is absolutely impossible to say that a water contains, for instance, the germs of typhoid fever—for typhoid fever germs may be and have been isolated from water samples—but our tests are not so reliable that if we obtained a negative result we could say that the water was not infected. We hope the time will come when we may do this, but we cannot do it now.

At present, therefore, in order to be on the safe side, we must consider contamination as potential infection, inasmuch as infection originates in contamination, and we must deal with a contaminated water as though it were infected.

The interpretation of a water analysis is a difficult matter and one which requires a wide experience with different classes of natural and polluted waters. To distinguish between contamination and befoulment is often a difficult matter even for the expert. In all cases a knowledge of the natural or normal quality of the water must be known, or at least mentally estimated, before the results of the analysis can be properly interpreted. It is for this reason that a knowledge of the source of the water is necessary to the analyst and that modern sanitary science lays so much stress upon the importance of sanitary inspection.

For an ordinary man to draw a conclusion from the figures of a chemical analysis is like trying to determine the state of business by studying the stock quotations as they appear for a few moments on the ticker. If he has a mental picture of all that has

happened on the market for many weeks the quotations may mean something to him, but otherwise they do not.

When all is said we must admit that we cannot classify waters by analysis into groups as sharply defined as these outlined above, because the analyses overlap. For example, albuminoid ammonia may mean pollution, or befoulment, or merely that the water is naturally stained. I will not confuse your minds, therefore, by stating rules which must have so many exceptions.

Now, to return once more to our definitions. We have seen that a pure water, even a reasonably pure water as understood by the ordinary water consumer, implies much—a water uninfected, uncontaminated, undefiled and practically unstained (colorless), unsoiled (clear) and untainted (odorless). Now, to purify a water in the full sense of the term is to render that water pure, but any process which tends towards making it pure is certainly a purification process. Thus, decolorization is a purification; clarification is a purification; deodorization is a purification and disinfection is a purification. When one speaks of the natural purification of water, therefore, he is using a term which may mean many things and which may be easily misunderstood. There are many natural purification processes continually going on in rivers, lakes, reservoirs and even in water-pipes, some acting on one constituent of the water and some on others. Most people, perhaps, when they speak of natural purification have in mind processes which make the water safe to drink, that is, processes of *discontamination,* if we may use that word. This is of course the important thing from a water-supply standpoint, but minor processes of purification are often to be considered and are frequently much more conspicuous.

After this long introduction I wish now to take up the main topic, but to limit it to the pollution of streams by sewage and the natural processes of discontamination as related to public water supplies.

Suppose we begin by taking a concrete example and assuming that the sewage of a city of one thousand people runs into a stream at a certain point. The water consumption of the city is 100 gallons per capita, hence the average daily volume of sewage is 100,000 gallons. The stream has a drainage area of 100 square miles above the city and we may consider the mean daily flow to be 100,000,000 gallons a day, the ordinary minimum flow to be 10,000,000 gallons, and the ordinary maximum flow 2,000,000,000 gallons. Assume the water in the river and all

its tributaries to be fairly satisfactory in character, reasonably clear and colorless, soft and containing no excessive amounts of mineral matter, and assume there is no other pollution on the watershed. The problem is to ascertain the effect of the contamination on the stream immediately below the city and at a point sixty miles down stream. Let us consider one by one the various elements which enter into the problem.

1. First of all we must know the character of the sewage itself, and in order to learn this it is not sufficient to collect a single sample at random, because the character of sewage changes from hour to hour. If a series of analyses representing different conditions cannot be secured the next best thing is to collect a sample by integration, collecting portions every hour or every two hours through the day and night and mixing them in proportion to the quantity of sewage flowing at the time the collection was made. If satisfactory analyses cannot be obtained we must rely upon what we know in general as to the quality of sewage matter. On a per capita basis this is more constant than might at first be supposed. The following figures represent the combined results of a recent compilation of analyses and estimates by the leading authorities.

Estimated Average Constituents of Sewage in Grams per Capita Daily.

	Total solids.	Organic.	Mineral.	Chlorine.	Nitrogen.	Albuminoid ammonia.	Free ammonia.
Fecal matter	70	50	20	7	8	.....	9
Domestic sewage	110	60	50	10	10	1.4	6.5
Domestic sewage plus polluted ground water	170	70	100	20	11	1.7	7.0
Domestic sewage plus street wash	220	100	120	25	13	2.0	8.0
Domestic sewage plus manufacturing wastes	220–500	100–300	120–300	25–50	13–15	2.0–4.0	5.0–10.0
Average	167	77	90	18	11	1.7	

These figures are in grams per capita daily, and when the per capita flow of sewage is 264 gallons a day the same figures stand for parts per million. If the flow is different from this it is easy to take proportional parts. Thus, in the assumed case the flow is 100 gallons a day, consequently the figures representing parts per million will be $\frac{264}{100}$ of those given in the table. For "domestic sewage plus street wash" we then have the following average analysis:

	Analysis of sewage estimated from figures of per capita constituents. (Parts per million.)
Total solids	580
Organic matter	264
Mineral matter	316
Chlorine	66
Nitrogen, total	34
" as albuminoid ammonia	5.3
" as free ammonia	22

The number of bacteria in ordinary may be taken as about 350,000,000,000 per capita, or in round numbers 1,000,000 per cc. when the sewage flow is 100 gallons a day. One tenth of these may be taken as B. coli, or say 100,000 per cc.

2. We must also know the quality of the water of the river, and for this purpose one or more analyses should be made, and the following constituents determined.

- Physical examination
  - Temperature
  - Turbidity
  - Color
  - Odor
- Chemical analysis
  - Oxygen consumed
  - Nitrogen as
    - Organic nitrogen
    - Albuminoid ammonia
    - Free ammonia
    - Nitrites
    - Nitrates
    - Total
  - Residue on evaporation
    - Total
    - Suspended
    - Dissolved
    - Loss on ignition
    - Fixed residue
  - Iron
  - Magnesium
  - Total hardness
  - Alkalinity
  - Incrustants
  - Chlorine
  - Acidity
  - Free carbonic acid
  - Dissolved oxygen
- Microscopical examination
- Bacteriological examination
  - Numbers of bacteria
  - B. coli tests

3. Knowing the quality of the sewage and the water, the next question is to ascertain the proportion in which they are mixed. We have assumed 100,000 gallons of sewage a day and an average flow of the stream of 100,000,000 gallons. The average initial

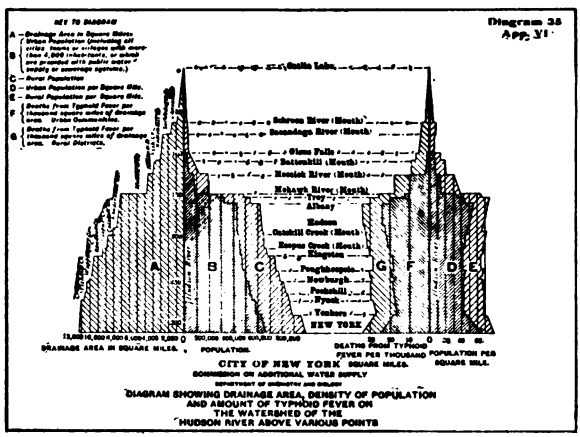
dilution is therefore 1 to 1,000. At times of low water, however, it might be as low as 1 to 100, while at times of high water it might be 1 to 20,000. As the stream flows it increases in volume by accessions of ground water and tributary streams. Let us assume that 20 miles below the city the drainage area has increased to 300 square miles, that 40 miles down stream it is 500 square miles, and 60 miles down 800 square miles. Then at the latter place the average dilution would be 1 to 8,000, the minimum 1 to 800, and the maximum 1 to 160,000. This subject of dilution is not always given as much weight as it should have and its effects are often ascribed to other causes.

Take for instance the number of bacteria in the water. Our assumed sewage contains say 1,000,000 bacteria per cc., while the river water above the city contains say 200. After the sewage has been thoroughly mixed with it, there will be at times of average flow, 200 plus $\frac{1000000}{1000}$, or 1,200 bacteria per cc. Sixty miles below the city there will be 200 plus $\frac{1000000}{8000}$, or 325 per cc. The reduction in sewage bacteria here is from 1,000 to 125, or 87½%. This of course assumes no other cause acting and represents only a scattering of the bacteria through a larger body of water. Is this purification? Yes, in a certain sense, of course it is, though it involves no destruction of bacteria. It is mere attenuation; yet it is effective in diminishing the danger of infection and if continued far enough it would reduce the danger to a negligible quantity. Streams may, therefore, tend to purify themselves by dilution, provided that the accessions of water which they receive are at least as pure as the river water itself.

In considering dilution, seasonal variations of stream flow must be taken into account. During the time of spring floods the dilution may be several hundred times as great as in the late summer when the tributary brooks are almost dry. Seasonal variations in the natural quality of the water must also be reckoned with. Take once more the number of bacteria in our assumed stream. If the average number of bacteria is 200, the chances are that during dry weather this number will fall to 50, while during the spring floods it may rise to 2,000 because of washings received from the surface of the ground. Thus, when the flow is at its minimum the number of bacteria in the river 60 miles below the entrance of the sewer will be 50 plus $\frac{1000000}{800}$, or 1,300 per cc., while at the time of maximum flow it would be 2,000 plus $\frac{1000000}{160000}$, or 2,006 per cc. Comparison of these figures without considering the other factors might lead to an erroneous

conclusion, as in the latter case a far smaller number of bacteria would be of sewage origin.

In studying the pollution of a stream the relation between the drainage area of the stream and the population sewering into it is of fundamental importance. A convenient unit is that of "population per square mile," or still better, "urban, or sewered population per square mile." Fig. 1 shows a diagram of the Hudson river, giving these data at various points from source to mouth. The effect of the tributaries and the large cities on the population per square mile is clearly brought out. The diagram also shows certain typhoid fever data arranged in the same manner.



Chlorine is an element which practically does not undergo change in a stream except from dilution. For this reason it is better than most of the other parts of the analysis for measuring dilution.

It has been estimated that ordinary domestic sewage contains 25 grams per capita of chlorine, chiefly in the form of common salt. On the basis of the average stream flow above mentioned, namely, 1,000,000 gallons per square mile, it is estimated that it requires a population of 200 per square mile to increase the chlorine in the water one part per million. This is a very useful figure to bear in mind. In the particular case assumed, namely, 1,000 people on a watershed of 100 square miles, the chlorine in the water would be increased by only 0.05 parts per million at times of average flow, or 0.5 parts per million at times of minimum flow, quantities too small to be detected by the ordinary water analysis. Chlorine may be derived from other than

domestic sources, however, and this too has to be considered. In practice it is more often that the pollution of the stream is estimated from the analysis by knowing the amount of chlorine normally present in the water and from this ascertaining the excess of chlorine above the normal.

I mention these facts chiefly to show that the mathematics of the self-purification of streams is of fundamental importance.

4. Another factor which affects the quality of river waters may be considered under the head of "Sedimentation and scour." Many, and I might say most, of the objectionable constituents of sewage are not dissolved in the water, but are in suspension. The suspended matter includes silt, clay, bits of paper and other kinds of organic matter, threads, microscopic organisms, bacteria, etc. All of these tend to settle to the bottom, and the rate at which they will settle depends largely upon the size of the particles and upon the velocity of the current. If the water is quiet they will settle rapidly, leaving the upper strata clearer, and hence to that extent purer. Sedimentation, therefore, is one phase of discontamination, and an important one. In some streams, and especially in lakes, it is often the most important factor. In the case of many muddy water supplies of the middle west this form of purification is solely depended upon, but there the water is brought to a state of quiescence in settling basins.

Sedimentation occurs to a greater or less extent in all streams —being, of course, greatest where the current is least. It is necessary, therefore, to obtain data bearing upon the currents— and these naturally include the slope of the stream, its depth, its cross section, etc. The presence of mill-dams is also important, as the ponds behind them sometimes make excellent subsiding basins.

Sedimentation must not be considered as a permanent form of purification. It is only half the story. Scour must also be considered. By scour is meant the removal of deposited matter from the river bed by currents of increased velocity. The suspended matter may slowly settle along the river bed for several months in a year, and then be washed down stream during a single freshet. Scouring, therefore, tends to pollute, or rather to distribute the pollution which the river has accumulated. Sediment which has deposited back of a dam may escape the full effects of the scour and in this case the purification is more permanent.

The mathematics of sedimentation are somewhat elaborate but very instructive, and I cannot do better here than to refer you

to a paper on the subject recently presented to the Am. Soc. C. E. by Allen Hazen.*

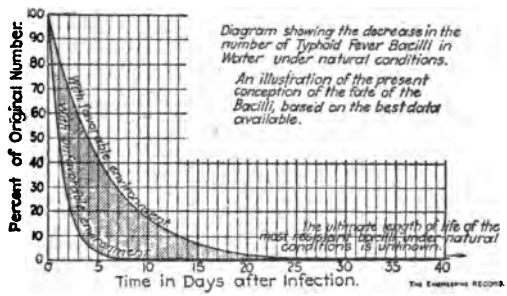
5. The time required for the contaminated water to flow from the sewer to the down stream point under consideration is of vital importance in the natural disinfection of the water. The longer the time, the greater the degree of disinfection. This is true for several reasons. Time influences sedimentation, as already described, and it gives opportunity for several other purifying agencies to accomplish their work. Among these are the natural death of pathogenic bacteria because of unfavorable environment; the disinfecting influences of sunlight; the effects of aeration; and the antagonistic influences of other organisms on the sewage bacteria. It is because of these discontaminating influences which depend largely upon *time* that stored waters are safer to drink than waters recently polluted. The great storage reservoirs of the Croton supply of New York exert a most important and highly beneficial influence on the health of the city. River waters, on the other hand are much more likely to retain their infection up to the time when they are used. If you will stop and think of it, you will recollect that most of our cities which have suffered severely from typhoid fever have used river waters without long storage. Witness Philadelphia, Pittsburg, Albany, Lawrence, etc., and also that most of the great typhoid fever epidemics have been due to recently infected river waters. Old age does more for water than it does for wine.

6. The natural death of intestinal pathogenic bacteria in water is best illustrated by the typhoid fever bacillus. The natural habitat of this organism is the human intestine. Outside of the body, under natural conditions, it is not likely to find favorable environments. Ordinary water is not a favorable environment and it has been repeatedly proven by laboratory experiment that when typhoid fever germs are put into water and allowed to stand they suffer a very great decrease in number. At first the decrease is rapid, on account of the death of the less hardy individuals, but later the change is more gradual, and a few of the bacilli are able to live in water for a very long time. Just how long they may survive under natural conditions is not definitely known, but from the results of laboratory experiments and from the data of typhoid fever statistics there is good reason to believe that some individuals may survive for many weeks and even months. The diagram shown in Fig. 2 illustrates in a general

* Trans. Am. Soc. C. E. Vol. LIII, 1904, Page 45.

way how these typhoid fever bacilli decrease in water on standing. Naturally the rate of decrease is greater in some cases than it is in others and this rate depends upon the vitality of the bacilli themselves, the temperature of the water, the organic and mineral matter present and quite largely upon the amount of oxygen dissolved. Recent experiments have shown that they are able to live somewhat longer in waters which are comparatively pure, but which contain some organic matter and an abundance of dissolved oxygen, than in water which is highly polluted and deficient in oxygen. There is also an antagonism between the common water and sewage bacteria and the typhoid bacillus. The nature of this antagonism is not well understood, but that it exists and that it is a potent factor in destroying the typhoid bacillus seems certain.

Overlooking for the present some of the abstruse bacteriological questions involved in this subject, it is sufficient for



practical purposes to know that the typhoid fever bacillus decreases in water on standing because of the actual death of the organisms. This is of course a true natural discontamination and disinfection of the water, and all in all it is perhaps the most important one to be reckoned with. Those who are interested in the bacteriology of the subject will do well to consult the papers which have been written by Dr. Jordon, Dr. Russell, Dr. Frost and others in connection with the celebrated Chicago Drainage Canal Case. (See Journal of Infectious Diseases. Vol. I.)

7. Sunlight is a valuable disinfectant as every sanitary inspector knows. As a destroyer of the tubercle bacillus in sputum its importance is very great. As a means of disinfecting water, however, its importance is too often over-emphasized. Laboratory experiments, it is true, show that bottles of water con-

taining bacteria may be rendered almost sterile by exposing them to sunlight for a comparatively short time. It must be remembered, however, that the sun's rays lose their intensity very rapidly as they penetrate a body of water. Only a few feet below the surface in a clear lake their energy is a mere fraction of that which strikes the surface and when the water is turbid or colored the loss of energy below the surface is much greater. Experiments which I once made by exposing bottles of water containing an easily identified bacterium at different depths below the surface of a pond showed that the sterilizing effect of the sun's rays was not very important below a depth of two feet; and in general it may be said that only the water near the surface of a lake or river is practically influenced by sunlight. Moreover the action of the sunlight on the bacteria is not instantaneous. It requires some little time for it to be effective hence, in natural bodies of water where there is constant movement the effect of sunlight is small. Nevertheless in shallow places in streams this is a factor which should not be overlooked in considering the subject of discontamination.

8. Aeration has little direct effect as a discontaminating agency. Its influence on bacteria is almost *nil.* It does have an effect however, on the organic matter in the water and its general action is beneficial. Water may be aerated in two ways, oxygen may be forced into it, or it may be exposed to the atmosphere so as to absorb oxygen, while at the same time gases dissolved in the water may be liberated. The latter action is often much more important than the former, because odoriferous gases may be lost thereby improving the odor and getting rid of gases which sometimes act prejudicially on these bacteria which tend to break up the organic matter.

9. The antagonistic effect of one group of bacteria on the typhoid bacillus has already been mentioned. There is another form of antagonism which in some places is of equal importance. Along the shores of many streams the rocks are covered with growths of water weeds and filamentous algae while in and among these and floating in the water are many small microscopic organisms, both animals and plants. Experiments have shown that some of these organisms consume vast numbers of bacteria as food, while others apparently yield products of growth which are prejudicial to bacterial life. In shallow streams where water weeds are thick this may be a most important discontaminating and disinfecting agency.

10. The presence or absence of ice in a river seems to make a considerable difference with the disappearance of bacteria in the stream. During the winter, when the surface of the water is sealed, the decrease in the number of bacteria in a polluted stream as it flows appears to be very much less than it is during the summer. This was shown in a striking way by some comparative experiments on the water of the Kennebec River between Waterville and Augusta, Maine, which I made during November 1903 and February 1904. The Kennebec River receives a large amount of sewage at Waterville, so much that just below the outfall of the city sewer the water contains from 20,000 to 30,000 bacteria per cc. Samples taken at intervals of one mile down the river from Waterville to Augusta, eighteen miles below, showed that in November, when the river was open, the number of bacteria gradually decreased from 30,000 at Waterville to 860 per cc. at Augusta, while in February 1904, when the river was thickly covered with ice the number of bacteria at Augusta was 25,000, almost as high as at Waterville. With the river frozen the effect of sunlight, aeration, and the antagonistic influences of plant and animal life were not present while the flow of the stream at that time was somewhat greater. In this connection it is well to remember that many of our most serious typhoid fever epidemics which have been due to infected water have occurred during the winter months.

Thus far I have considered the discontamination of streams almost entirely from the bacteriological standpoint but there are other things to be observed. Sedimentation results in making a contaminated water clearer; the effect of sunlight tends to bleach out the color; the exposure of the water in thin films to the atmosphere, which occurs when the water ripples over stones or passes over water-falls, gives opportunity for odoriferous gases to escape, thus improving the odor; aeration and the action of bacteria tend to reduce the organic matter in the water as time goes on. In various ways therefore, both physical and chemical, the water in a stream improves in appearance and in chemical quality. These are the factors which alone were considered in the early days when the theory of the self-purification of streams was first put forth. They are more conspicuous than the bacterial features but where water supplies are concerned the two must not be confounded.

There can be no doubt that to a certain extent polluted rivers do tend to purify themselves and even to become partially discon-

taminated and disinfected; but most of the agencies mentioned are very often uncertain and they cannot be depended upon to render the water perfectly safe for use. The dictum that "a stream once polluted is always polluted" is not true. Yet it will be far safer for us to base our plans for water works upon it than to rely upon the equally untrue theory that "water completely purifies itself after running a certain number of miles."

Commissioner Porter—GENTLEMEN: As the second speaker of the evening, it affords me pleasure to introduce Mr. Robert Spurr Weston, of Boston, who will address you on the subject of "The Purification of Public Water Supplies."

ADDRESS BY ROBERT SPURR WESTON, C. E.,

Boston, Mass.

The Purification of Public Water Supplies.

(Illustrated.)

Mr. Chairman and Health Officers of the State of New York: A more proper title for the speaker's paper would be "The Winning of a Pure Water Supply," including within its meaning the purification of water.

Since the year 1890 there has been a marvellous raising of ideals and standards for the quality of public water supplies. A water which is pure from a sanitary standpoint alone no longer satisfies the critical taste of the American people. For example, the water supplies to such cities as New York, water which is fairly safe when the typhoid fever death rate is taken into consideration, is filtered before use in most of the hotels and apartment houses and in many private residences. Many other people, disliking the disagreeable water, buy spring waters, some of which are of questionable quality. Herein lies a danger.

Some time ago the speaker made a private study of the relation existing between the appearance of certain water supplies of Massachusetts cities and towns and their respective typhoid fever death rates. The waters were separated into three groups or classes, according to the speaker's personal taste. The first class included those supplies which were practically "perfect" in appearance, that is, free from odor, color or disagreeable taste. The second class was called "satisfactory" and comprised water with unobjectionable odors, colors or tastes, while the third class included all the "unsatisfactory" waters, those which possessed disagreeable amounts of color, odor or were unpleasant to taste.

All of these supplies were practically free from sewage pollution. It was found that the consumption of well and spring water varied with the appearance of the water. In one city—Brockton—the introduction of a new and better, though not necessarily purer supply, was followed by a decrease in the spring water business.

It was observed that waters of the first class were associated

with a typhoid death rate of 15, those of the second with one of 17, while those of the third were associated with a typhoid fever death rate of 25 per 100,000 inhabitants. These results could be connected in no way with the social characteristics of the various cities and could not be explained by climatic or geographical differences, forcing one to believe that the use of spring and well waters in the cities of the third class had been bad for the public health.

A satisfactory water supply, therefore, must satisfy aesthetic and sanitary requirements, strange to say, for sanitary as well as for aesthetic considerations. To show how such a supply can be obtained is the object of this paper, although the treatment must necessarily be very general.

Water from running streams cannot be recommended without it be purified either by long storage in a suitable reservoir or by carefully conducted filtration.

The slides to be shown later on will illustrate the methods of gathering ground or well water. These supplies are rarely developed in America to the extent they are in Europe and although no Alpine or Appennine foot-hills lie in the neighborhood of our great cities, a greater development of these sources of supply may be expected in the future than in the past.

The map thrown upon the screen will show the existence of many available ground water areas, especially along the Atlantic seaboard, in the Central States and in the far West.

Ground water may be collected in tile drains running into a common reservoir, in wells, dug or tubular, or by a tunnel driven through the water-bearing stratum, the latter construction being known as a filter gallery.

While ground waters are least liable to be polluted with sewage, they are apt to contain matter dissolved from the soil, giving rise to objectionable "hardness" or dissolved iron. The former condition renders the water unfit for industrial purposes and for use in steam boilers and with soap, in laundry or lavatory. Both of these objectionable features may be removed by softening or filtration. This is a subject in itself and cannot be discussed longer. Examples of iron-bearing waters are those at Far Rockaway, N. Y., and the artesian supplies along the New Jersey coast, while Cortland, N. Y., is supplied with a typical hard water.

Very few surface waters can be used for public supplies unless purified, for while the waters of a lake—Lake Erie for example—may be acceptable from an aesthetic standpoint, it is very fre-

quently in danger of infection with the sewage from the very city which it supplies. Very frequently the current in the vicinity of such a city is very sluggish, and again it moves from sewer outfall to waterworks intake. Burlington, Vt., is supplied with water polluted with her own sewage. The same is the case to a greater or less extent in Cleveland, Duluth, Chicago, Milwaukee, Racine and Sandusky, or in fact in most of our lake cities. Of course the remedy is plain. It is the same remedy that would have to be applied in the case of a polluted surface water—namely, filtration through a properly designed filter, at the same time excluding the sewage pollution as far as practicable.

The purification of water by storage has been the method in most common use in this country, in fact, most of our safest water supplies have been obtained in this way. Examples are the water supplies of Portland, Me., Boston, Mass., and Rochester, N. Y., and of most of our northeastern cities which are so situated near the hills that convenient reservoir sites are easily obtained. This method of getting a good water supply is not possible in the central alluvial plain of the United States, nor to any great extent in the south or the middle west. On the Pacific coast, on the other hand, the mountains are of such a character and are so near the cities that this method comes again into use.

Purification by filtration is the one most commonly applicable to all surface supplies. All of course are more or less familiar with the filter plant at Albany, a slide of which will be thrown on the screen and which will illustrate the general construction of these filters.

Water filters are of two general types—the slow sand filter and the rapid sand or mechanical filter. Both filters usually consist of a basin filled with sand and supplied with proper under-draining devices for removing the water which has passed through the sand.

The essential feature of the slow filter is the film of bacterial jelly which forms around the sand grains and which, as the water passes through the same, attracts by some physical process which is not understood even theoretically, the suspended matter, including the bacteria existent in the water, or the antagonism of the bacteria around the sand grains may effect a disappearance of the bacteria present in the water. This filter removes the bacteria from the water so that the effluent which is collected from the under-drain system is reasonably free from these organisms, well

operated plants removing over ninety-nine per cent., from which data it seems fair to assume that harmful bacteria are removed to at least as great a degree. The slow filter usually filters at the rate of a vertical yard a day—that is, the level of the water above the sand would fall this distance during twenty-four hours, while the rapid filter operates at a rate about twenty times as great.

Both filters become clogged after a certain period of operation. The slow filter is cleaned or regenerated by draining the filter, scraping the surface and removing the dirty sand, after which it is filled from below with filtered water and is then put into operation as before scraping. The rapid filter, on the other hand, clogging more frequently, is cleansed by reversing the current of water flowing through the filter, thereby washing the accumulated suspended matter and bacteria into a waste-way. During washing, the sand in the rapid filter is often scoured by means of jets of compressed air or by a mechanical agitator. The high rate of filtration possible with a mechanical filter is because coagulants are used, the one in most common use being sulphate of alumina. When this is added to a water which has a sufficient amount of alkali in it, it precipitates in a flocculent form. This precipitate exerts a coagulating action upon the suspended matter in the water and also upon the bacteria, forming little coagula which are too coarse and too gelatinous to readily pass through the sand layer of the filter. In other words, the individual particles of suspended matter and bacteria might pass through the sand, but when gathered into bunches they are unable to do so.

There are conditions where only one of these filters would be applicable; there are conditions where either of them would be. For example, in Albany there is a slow filter and at Rensselaer, across the river, there is a rapid filter, both giving very satisfactory results. On the other hand, the slow filter without coagulants would not be efficient with the muddy waters of the Central West, because the particles of clay are so fine that they cannot be retained by a slow filter when they are present in great amount. On the other hand, a slow filter is not applicable for the removal of color, because it seems necessary to absorb this color by means of some sort of a gelatinous precipitate, such as the aluminum hydrate produced by the addition of sulphate of alumina to an alkaline water. Again, in the case of hard waters which are very clear, and which have no color or turbidity, treatment by mechanical filters is extremely difficult, because there seems to be much more difficulty in starting coagulation where

the water is clear and free from suspended matter. The precipitation of small amounts of sulphate of alumina, in other words, is aided by a "starter," such as the clay contained in western river waters. If the water is not perfectly treated before reaching the filter, the suspended matter and bacteria will not be retained by the sand bed.

There is another way of obtaining a pure water supply, namely, from the clouds, and in some tropical states, like Louisiana, these supplies are often of excellent quality. In the thickly settled parts of New Orleans, on the other hand, the rain water collected from dirty roofs is far from satisfactory.

As an illustration of these methods of obtaining a pure water about fifty lantern slides will be shown. These slides show the construction of reservoirs, purification plants, well water supplies and other parts of complete waterworks, both in this country and abroad. Among the purification plants illustrated are those at Albany, N. Y., and Little Falls, N. Y., as well as the proposed new system for the city of New Orleans. Some lantern slides will be shown to illustrate the reduction in the typhoid fever death rate following the introduction of pure water. These slides are very striking. There will also be illustrated a most remarkable fact which has been brought out by Mr. Allen Hazen, that not only does a reduction in the typhoid fever death rate follow the introduction of the pure water supply, but there is also a reduction in the general death rate as well, Mr. Hazen giving it as his opinion, after a careful statistical study, that for the reduction of one death by typhoid fever, there is a corresponding reduction of three or four deaths from other diseases.

In closing this paper the speaker would like to call to the attention of all those who have the care of the public health, that they use their influence toward the construction of waterworks and water purification plants which are best adapted to local conditions, and that they not only see that these plants are well designed but that they are well operated. Water purification in the United States has not always been the success that it has been at Albany—not always because the filters were not well constructed, but that they have not been carefully operated. It is absolutely necessary that these plants have skilled supervision, that chemists and bacteriologists be employed to check the results of the filters, and that competent foremen be placed in charge of their operation.

All health officers can do a great deal to help along the cause

of pure water if they would use their influence to establish a record of the character of the waters of their state, district or municipality, to see to it that the turbidity, the color, the amount of lime and other salts and the degree of pollution of every stream in this state is known; that the character and yield of all the available ground waters in your state are on record and that the degree of pollution of the lakes in your state is well known, so that whenever the question of an improved water supply arises in any municipality there will be abundant data upon which the designing engineer can base his judgments with a fair assurance of success.

ADDRESS BY PROF. OLIN H. LANDRETH,

of Union College; Consulting Engineer of the State Department of Health.

WATER RESOURCES OF NEW YORK STATE AVAILABLE FOR POTABLE WATER SUPPLIES

MR. COMMISSIONER AND GENTLEMEN OF THE CONFERENCE: Today has been for you a *watery* day. You saw this afternoon at Saratoga a modern miracle, not the turning of water into wine but the conversion of sewage into fairly potable water. Tonight you have listened to two valuable papers, one in relation to the nature of the pollution of waters, and another describing the principles and methods of water purification. Beside these the program for this evening provides for two further papers on water examination scheduled to follow mine.

Believing, therefore that you have already doubtless passed the physiological limit of saturation by water, or at least by its principles, and recognizing that it is already very late in the evening, I am not going to read my paper but shall ask leave to print and shall yield the time to the next paper which as health officers frequently concerned with the making and interpretation of water analyses, you certainly should hear.

The subject of the available water resources of the State is an exceedingly extensive one and one of great importance to the general public health and I should not pass the presentation of the paper at this time but for the extreme lateness of the hour and but for the knowledge that it may reach you in print.

[The paper of Prof. Landreth will be published in the Annual Report of the State Department of Health for 1905.]

Commissioner Porter—Professor Tucker has a word or two to say this evening in the closing paper on the program. What he has to say is of considerable importance to us as members of the Department, and I hope you will give not only attention to what he says, but will heed his advice. (Applause.)

ADDRESS BY DR. WILLIS G. TUCKER,

Director Bureau of Chemistry, State Department of Health.

THE COLLECTION OF WATER SAMPLES FOR CHEMICAL ANALYSIS.

MR. COMMISSIONER, LADIES AND GENTLEMEN: The hour is late and I shall take but ten minutes for what I have to say, confining myself to the topic set down for me on the program with a very brief reference to the nature of the routine water analysis made by the Department at the present time. I shall not attempt to discuss the general subject of the sanitary value of the chemical analysis of potable waters, nor to indicate what policy, in my opinion, should be adopted by the Department in the matter of the investigation of the water supplies of the State and in the event of the Legislature making suitable provision for prosecuting this important inquiry. What I shall say at this time will be elementary in character, entirely practical in its application, and appropriate to existing conditions without reference to future possibilities.

The examination of waters used for drinking is a matter of much practical importance to the health officer. Many diseases are water-borne, and many epidemics are traceable to polluted water supplies. A single well or cistern, specifically polluted, many disseminate typhoid fever over a wide territory, and the dejecta of a single patient washed into a reservoir may be the cause of a thousand cases and a hundred deaths as at Plymouth, Pennsylvania, in 1885. And since it is essential that samples of water intended for analysis be carefully and properly taken and promptly forwarded, and that full information concerning the samples be sent with them, I have been asked to say a few words as to the proper selection, collection and forwarding of samples intended for chemical examination.

The object of a sanitary water analysis being the determination of fitness for domestic use I shall make no reference to the determination of mineral constituents, the analysis of mineral waters, or those intended to be used for technical or manufacturing purposes, save to remark in passing that if the amount of mineral

matter in a water be not so large as to render it unduly hard it makes very little difference from a sanitary standpoint what its inorganic constituents are. I am often asked whether there are not some easy tests by which the purity of a water may be judged, but there are none upon which much dependence should be placed. If a water is clearly dirty, or its source so situated as to indicate evident pollution by neighboring barn-yards, cesspools, drains or privy-vaults, or, in the case of a stream or other body of surface water, if its pollution by sewage is *apparent,* any kind of examination may be unnecessary. Such waters may not of necessity in all cases give rise to specific diseases, but they are unfit for use and may at any time be specifically contaminated and become *foci* for disseminating disease. I often wonder why some samples that I receive are sent to me. No chemical analysis is necessary to demonstrate the presence of evident filth, and while the system is tolerant, and a man in his lifetime may consume the traditional peck of dirt, we need not dwell upon the fact that a water which is *dirty,* and easily seen to be so, is not fit for domestic use. But the converse of this proposition is not necessarily true. A dirty water is unfit to drink, but a water may be unfit to drink and yet unobjectionable to the senses. If asked how such may be distinguished I reply that neither the chemist nor the bacteriologist can answer the question with certainty. Different kinds and amounts of polluting material may be recognized, and those products which ordinarily accompany the decomposition of organic matter of animal origin, as sewage, may be distinguished, and danger pointed out, or probably safety indicated, but neither chemist nor bacteriologist is ordinarily able to assert positively that a water is certainly innocuous, or will necessarily give rise to disease. Much misconception exists upon this point and while sanitary examinations of water are often most helpful all methods now in use have their limitations and this fact should be recognized.

Pure water of course does not exist in nature. In flowing over the earth, or percolating through the soil, water takes up more or less material which is held, partly in solution and partly in suspension. This material may be inorganic or organic, living or dead. Except in so far as inorganic matter may have resulted from the decomposition of organic material, and afford evidence of past pollution as by sewage we have seen that it is not of much importance in the case of potable waters. The organic material is the important consideration and this may be of animal or

vegetable origin, and either living, or dead and undergoing decomposition. Living vegetable growths *may,* and in impounded waters frequently *do,* impart a disagreeable odor and unpleasant taste, and the products of decaying vegetable matter may impart objectionable color, taste or odor, as seen for example in the case of peaty waters. With bacterial organisms we are not concerned, nor shall I take time to speak of living animal organisms either microscopic or macroscopic, but the chemical products resulting from the decay of matter, especially if of animal origin, and originating in excreta or domestic waste and sewage, are of prime importance because they may indicate dangerous pollution. They may not in themselves be harmful, but their presence in drinking water is evidence that such water is liable at any time to receive and convey specific infectious material. The chemist endeavors therefore to distinguish between the products of the decay of vegetable and animal matter, and to ascertain whether pollution is recent or remote, and if he discover distinct proof of recent sewage pollution, including under this term animal decomposition products and wastes of all kinds, he advises against the use of such water. He may not be justified in asserting that such water will necessarily produce disease, and he seldom or never makes such a prediction, but he deems contamination of the kind described, if it be material and plainly discernible to be sufficient reason for condemning a water which may at any time become specifically polluted and serve to convey disease. At the present time neither chemist nor bacteriologist attempts to identify specific bacteria, associated with infectious diseases like typhoid fever, in actual water supplies by the ordinary routine laboratory methods, a fact which seems to be not generally understood but which ought to be clearly stated.

Time will not permit me to enter upon any description of the processes employed in the chemical examination of waters, but I may perhaps with advantage to some present say a word concerning the terms used in our briefer reports. The appearance of the sample as to color, turbidity and sediment, are described in the simplest manner rather than by numerical expression involving the use of arbitrary scales which are not readily understood. The chlorine in drinking waters is chiefly in combination with sodium, common salt being a constituent of all sewage and house slops, except in the case of waters from peculiar localities.

Chlorine should be low, and when high, unless due to geological conditions or proximity to the sea, it ordinarily points to sewage

contamination. Free and albuminoid ammonia are determined by Wanklyn's method. They are generally low, and may be *nil,* in pure well waters; higher in ordinary surface waters, and if excessive ordinarily point to comparatively recent pollution, which, if the free ammonia be high, is more likely to be due to the presence of matter of animal than of vegetable origin. Albuminoid ammonia if high may be due to vegetable matter, but no hard and fast line can be drawn nor general rule laid down, and in construing such results the other analytical data must be taken into consideration. And the same caution must be observed in the case of nitrites and nitrates. Nitrites may be due either to oxidation of nitrogenous organic matter, or to reduction of previously existing nitrates. Under certain circumstances nitrites indicate comparatively recent sewage pollution, while nitrates may indicate more complete oxidation and destruction of organic matter. We must avoid hasty and unwarranted inferences, but in a general way it may be said that the presence of other than minute traces of nitrites in a drinking water may be *prima facie* evidence of pollution. Total solids are determined by evaporating a measured quantity of the water to complete dryness in platinum and weighing the residue. This is then ignited and the behavior of the residue during ignition noted, and the loss due to combustion of organic matter and other causes is reported, while the incombustible residue is put down as mineral matter. Some information may be obtained from the phenomena occurring during ignition as to the nature of the dissolved solids, as indicated by darkening, blackening, or the evolution of fumes or odors. A water very pure organically will yield a colorless residue and this will not darken on ignition. So far as the amount of the residue is concerned it is a matter of little importance unless so large as to be indicative of excessive hardness. All statements of quantity are expressed on the very generally adopted standard of parts per 100,000. Some chemists report in parts per million, easily convertible into parts per 100,000 by dividing by ten. Conversion into grains per United States gallon may be made approximately by multiplying by 0.6, and more accurately by multiplying by 58. 335 and dividing by 100,000.

And now a few practical hints as to taking and forwarding samples. But in the first place it should be said that the Department does not undertake to examine water for individuals, nor for health officers unless some reason exists. That is, samples are not examined merely to determine their purity or to satisfy curi-

osity, but only in cases in which contamination is suspected. In all cases before samples are forwarded to me the Commissioner of Health should be communicated with and the work authorized by him, and in sending samples the printed directions sent by him should be carefully and fully observed. All samples should be plainly marked by tags or labels attached to the containers, and these should indicate by whom sent, locality, and source from which taken. If boxed the package should be addressed to me, but the outside of the box should show from whom sent and from what place. And all samples should be fully prepaid to destination. Much trouble and unnecessary delay results from neglect to comply with our printed directions. And samples should always be accompanied with a letter stating number of samples forwarded, how and when forwarded and marked, and fully describing them and stating reasons for the desired examination.

All samples should be taken in glass containers and jugs should under no circumstances be employed. It seems hardly necessary to say that these containers should be new, or at least clean, and that they should be closed with new and clean corks, and yet we not infrequently receive samples in syrup jugs and old medicine bottles containing foreign matter rendering them entirely unfit for examination. Glass demijohns of gallon capacity are probably most convenient and these need not ordinarily be boxed. Wood-cased demijohns are excellent, but the ordinary wicker-covered article answers very well and unless very carefully packed in straw or saw-dust will generally come most safely if the shipping tag, with information on same as specified, is simply tied securely to the handle. In cold weather proper precautions should be taken to prevent freezing and caution label attached to packages. Corks should be well secured with cord and the ends of the cord may be sealed, but top should not be coated with wax. All samples should be promptly forwarded as it is very desirable that the analysis be made as speedily as possible after taking. Waters undergo material changes, in some cases at least, on standing, and they ought always to be promptly examined.

In taking samples from wells the usual pump or bucket may be employed, but any dippers, pails or funnels used should be clean. Even if new, the demijohn or bottle should be well rinsed with the water before filling, and an air space should be left under the cork. Water from cisterns will be withdrawn in a similar manner. In drawing water which is piped, whether private or public supply, it should be allowed to flow for a time before sampling,

and in every instance care should be taken to secure a sample which fairly represents the character of the water. In taking samples from streams, lakes or ponds, and reservoirs, care should be taken not to disturb the bottom, shores or margin, and, if the container is weighted and let down into the water, foreign matter from its surface must not be washed into the bottle, nor ordinarily should matter floating upon the surface of the water be allowed to enter. When ice is sent for examination it should be carefully and fairly selected. A cake of about twenty pounds weight should be wrapped in paraffin paper if procurable, and then in stout paper, and packed in clean saw-dust and properly marked to insure prompt delivery and its keeping in a cool place while in transit.

And, in conclusion, if we assume that the object sought be to obtain the fullest and most reliable information possible, it must be evident that the fullest information should be given to the examiner and that he should be treated with entire frankness and not expected to solve riddles. The chemist is no necromancer and if his aid is desired and his advice sought all information bearing upon the case which may aid him in construing his analytical data should be furnished him. He cannot pass upon samples as a soothsayer is expected by his dupes to read character and future prospects from a lock of hair. The mere locality from which a sample comes may have an important bearing in judging its character, and analytical results which might be highly significant in one case may have little significance in another. In construing them the analyst needs all the information concerning the source, surroundings, exceptional conditions if existing, and present and proposed uses of the water submitted which can be supplied him.

Dr. Tucker—Now, gentlemen, we come near the end of our conference and I would like to say a word and make a motion, and if the Secretary is here I shall ask him to put it. I think I may make this motion without indelicacy or impropriety since in the very admirable preparations which have been made for our entertainment and instruction here I have borne no part. I have been with you a partaker of these good things which have been offered to us and in no sense a provider, therefore my getting up to make this motion I am sure will not be misconstrued. I believe I express not only my own but every gentleman's opinion, for I have heard it expressed many times today and yesterday by those who have been privileged to attend these sessions, the very general opinion that they have been enjoyable from start to finish, that they have been profitable, that they have been admirably arranged and carefully and successfully carried through, and that this has been done by the Commissioner and by those associated with him in a manner which entitles him and them to our gratitude; and I move you, Mr. Secretary, that the thanks of this conference be tendered

tc Commissioner Porter for the very admirable preparation which has been made for the conference and for the entertainment which has been provided for us and the exercises which have been so profitable and enjoyable; that we desire to manifest our thanks and acknowledgment therefor, and I will call for a rising vote on this motion.

Secretary Seymour—Gentlemen, you have heard the motion; all in favor of the motion will rise. (All arose.)

Mr. Commissioner, the motion is unanimously carried. (Applause.)

Commissioner Porter—GENTLEMEN OF THE CONFERENCE: I assure you that I fully and thoroughly appreciate the thanks which you have just given the Department for what it has tried to do for the conference.

We have with us here this evening a prominent member of the medical profession, one, I think, who is well known to you all, and I could not feel that this conference was satisfactorily completed unless we heard something from Dr. Daniel Lewis. (Great applause.)

Dr. Lewis—Commissioner Porter, I wish first to express my gratitude to you for the very courteous invitation extended to me to attend the meeting this forenoon and also to express again my regrets that I was unable to keep my appointment.

I was glad to be invited to this conference. Somehow I thought as I now find, that I would see a great many familiar faces in this audience. I wanted to look at you, I wanted to shake your hands and congratulate you upon being health officers of the State of New York. I believe that the State Department of Health as now organized is one of the best in the United States, and as evidence of that I would refer to the splendid attendance which you have had at this session. We had a conference here a few years ago and we had hard work to keep an audience like this until eleven o'clock at night. I find we have got an audience now of representatives from all the different municipalities of the State. It is a good omen and shows public sanitation has become a question in which you are all equally interested. It did not use to be so. A health officer used to be in danger of spending all his time investigating pig-pens. I am wondering now, Mr. Commissioner, whether the woman at Hornellsville, I think it was, who complained of her neighbor piling brick beyond twelve o'clock at night in the house adjoining her residence—whether that case has been attended to. (Laughter.)

The meeting tonight shows that a larger idea prevails in the Department. The fact that you have stayed here and listened to these papers upon the character of water supplies and the purification of water shows that the duties of health officers have assumed new relations compared with the investigation of petty nuisances which are practically of no account from a sanitary point of view. I was interested in the table as to the effect of filtration in the city of Albany and other places.

If this work continues as it has been auspiciously begun and your administration continues to impress upon the health officers of the State the necessity for a pure water supply upon the lines which have been placed upon the statute books for its protection, then sanitation in the State of New York will mean something, and if you do your duty as health officers, remembering that you are all sanitarians, all sentinels upon the outposts for the protection of the health of the State, that it is to you the Commissioner must look for the first note of warning of danger, that it is your business to see that water supplies and water-sheds are protected and water supplies purified. Then you will be doing your duty and it will result in good beyond that which has ever yet attended any sanitary administration in this State or any other, a duty which you and I owe to the community. It is your duty to give to your people the information which you get at this conference. If the health officer who goes from this conference back to his village or town is not qualified to direct public sentiment in favor of better conditions in water supplies and other sanitary questions, if you don't go back prepared to enforce proper and legal legislation for the people under your

charge, then the great object which was in view when these conferences were established will have been mostly overlooked and nullified. The people have no other source of knowledge on this subject except through their health officers and local boards of health. It is time they stop being simply clerk or secretary or registrar or health officer. They should be a great educational force in the community to control and protect and secure such legislation as is necessary.

Excuse me, Mr. Commissioner, I did not mean to talk so long, but you should have known that if you got me started I would exceed the limits of time.

Commissioner Porter—My friends, I want to say just one word and have your attention for just one moment, if I may, before we say good bye to each other.

I do not believe you know how much we have appreciated your presence here, how much we have thought of the cordial and active interest that you have manifested in the proceedings of the conference or how glad we are that you seem to have enjoyed all we have prepared for you. We know it might have been much better; we are aware that perhaps next year we can improve upon this. I assure you we have tried to make this as pleasant and profitable as we possibly could and we are very glad indeed that you seem to have had here such a good time.

Now, gentlemen, when you go home I want you to feel that in all matters that pertain to public health you can call on this Department with confidence that the Department will be prepared in all proper cases to back you up, that the Department proposes to stand behind you; there is where the Department ought to be. On the other hand, gentlemen, we want you to stand behind us. We want some help next winter. We want to get some appropriations. We are going to try to get appropriations urgently needed to carry out important work. The stronger the Department grows because of the money we can invest in this work, the stronger the sanitary situation gets in the State.

Now, gentlemen, the Department gives you its best wishes and desires for you a safe journey home and a speedy return to the next Conference of the Sanitary Officers of the State of New York. Good bye! (Great applause.)

The conference adjourned *sine die* at 11 p. m.

DELEGATES IN ATTENDANCE AT THE SANITARY CONFERENCE.

ALBANY COUNTY.

Joseph D. Craig, M. D., Albany.
I. S. Becker, M. D., Altamont.
W. E. Deitz, M. D., Berne.
J. R. Davidson, M. D., South Bethlehem.
M. S. Reid, M. D., Coeymans.
John Archibald, M. D., Cohoes.
H. C. Abrams, M. D., Newtonville.
R. W. Terwilliger, M. D., Guilderland Center.
J. Crounse, M. D., Altamont.
W. F. Shaw, M. D., Voorheesville.
L. B. Rulison, M. D., Watervliet.

ALLEGANY COUNTY.

C. R. Bowen, M. D., Almond.
G. H. Witter, M. D., Wellsville.

BROOME COUNTY.

I. A. Hix, M. D., Binghamton.
W. H. Wilson, M. D., Lestershire.
C. F. Roberts, Lestershire.
H. C. Peck, M. D., Port Dickinson.
H. N. Christopher, M. D., Union.

CAYUGA COUNTY.

A. H. Brown, M. D., Auburn.

CATTARAUGUS COUNTY.

William Allanson, Cato.
C. F. Chiler, M. D., Montezuma.
William T. Cox, M. D., Moravia.
W. A. Strohmenger, M. D., Moravia.

CHAUTAUQUA COUNTY.

G. E. Ellis, M. D., Dunkirk.
J. A. Weidman, M. D., Dunkirk.
L. C. Baldwin, Fredonia.
W. A. Putnam, M. D., Smith's Mills.
W. J. Prish, M. D., Fredonia.

CHEMUNG COUNTY.

G. V. E. Merrill, M. D., Elmira.
O. J. Bowman, M. D., Horseheads.

CHENANGO COUNTY.

S. M. Hand, M. D., Norwich.

CLINTON COUNTY.

J. M. Hackett, M. D., Champlain.

COLUMBIA COUNTY.

B. A. Weeks, M. D., Blue Stone.
C. R. Skinner, M. D., Copake.
Rensselaer Platner, M. D., Germantown.
T. F. Woodworth, M. D., Kinderhook.
P. R. Flanagan, M. D., New Lebanon.
Z. F. Dunning, M. D., Philmont.
G. P. K. Pomeroy, M. D., Stuyvesant.

CORTLAND COUNTY.

F. H. Forshee, M. D., McGraw.
H. I. VanHoesen, M. D. ,Truxton.

DELAWARE COUNTY.

E. A. Holmes, M. D., Downsville.
G. C. Smith, M. D., Delhi.
J. A. Holley, M. D., Walton.

DUTCHESS COUNTY.

L. E. Rockwell, M. D., Amenia.
C. L. Fletcher, M. D., Dover Plains.
R. A. Hayt, M. D., Fishkill.
J. E. Moith, M. D., Fishkill-on-Hudson.
R. J. Carroll, M. D., Red Hook.
C. S. Vanetten, M. D., Rhinebeck.
George Tremper, Rhinebeck.
J. H. Dingman, M. D., Tivoli.
G. H. Van Wagner, M. D., Wappingers Falls.

ERIE COUNTY.

C. E. Bowman, M. D., Alden.
F. E. Fronczak, M. D., Buffalo.
F. A. Helwig, M. D., Akron.
Horace M. Edmonds, M. D., Tonawanda.
George Krauss, Tonawanda.

ESSEX COUNTY.

Thomas A. Wasson, M. D., Elizabethtown.
H. W. Rand, M. D., Keene Center.
Ellis Lengfeld, M. D., Lake Placid.
A. J. Merrill, M. D., Jay.
F. S. Cole, M. D., Schroon Lake.

FRANKLIN COUNTY.

D. E. Moody, M. D., Dickinson Center.
R. G. Feek, M. D., Brushton.
E. S. McClellan, M. D., Saranac Lake.

FULTON COUNTY.

John Edwards, M. D., Gloversville.
D. V. Still, M. D., Johnstown.
G. B. Ingalls, M. D., Mayfield.
Jesse Kilts, Mayfield.

GENESEE COUNTY.

W. H. Coon, Batavia.
W. B. Whitcomb, M. D., Batavia.
John W. Baker, M. D., Batavia.
R. M. Andrews, M. D., Bergen.
S. W. Skinner, M. D., Le Roy.
W. O. Burbank, M. D., Pavilion.

GREENE COUNTY.

Charles E. Willard, M. D., Catskill.
A. W. Van Slyke, M. D., Coxsackie.
A. Beach, M. D., Coxsackie.
P. G. Waller, M. D., New Baltimore.

HAMILTON COUNTY.

Fred Stevenson, M. D., Indian Lake.
Thomas McGann, M. D., Wells.

HERKIMER COUNTY.

Cyrus Kay, M. D., Herkimer.
W. E. Hunt, M. D., Little Falls.
Adam Miller, M. D., Jordanville.

JEFFERSON COUNTY.

W. H. Nickelson, M. D., Adams.
H. G. Dawson, M. D., Cape Vincent.
E. A. Simonds, M. D., Carthage.
A. L. Morgan, M. D., Dexter.
D. C. Rodenhurst, M. D., Philadelphia.
E. S. Willard, M. D., Watertown.
O. O. Stowell, M. D., Watertown.

LEWIS COUNTY.

H. A. Pawling, M. D., Lowville.
P. H. Von Zierolshofen, M. D., Croghan.

LIVINGSTON COUNTY.

Chas. V. Patchin, M. D., Dansville.
D. H. Foster, M. D., Scottsburg.
A. V. Watkins, M. D., West Sparta.

MADISON COUNTY.

William Taylor, M. D., Canastota.

MONROE COUNTY.

John L. Hazen, M. D., Brockport.
Joseph Pease, M. D., Hamlin.
R. E. Cochrane, M. D., Penfield.
P. D. Carpenter, M. D., Pittsford.
Horace J. Mann, M. D., Brockport.

MONTGOMERY COUNTY.

E. F. Bronk, M. D., Amsterdam.
H. N. Hicks, M. D., Amsterdam.
M. Jennings, Amsterdam.
S. A. Wessells, M. D., Canajoharie.
C. C. Vedder, M. D., St. Johnsville.

NASSAU COUNTY.

Edwin Carman, M. D., Freeport.
William Rhame, M. D., Wantagh.
J. H. Bogart, M. D., Roslyn.
H. G. Wahlig, M. D., Sea Cliff.

NIAGARA COUNTY.

W. Q. Huggins, M. D., Sanborn.
J. W. Rickford, M. D., Lockport.
F. N. C. Jerauld, M. D., Niagara Falls.
A. J. Martin, M. D.
M. J. Joyce, North Tonawanda.

ONEIDA COUNTY.

H. P. Whitford, M. D., Bridgewater.
W. H. Dewing, M. D., Clayville.
W. S. Morris, M. D., Deerfield.
T. C. Gifford, M. D., Holland Patent.
J. H. Whaley, M. D., Rome.
Wallace Clarke, M. D., Utica.
C. F. Nichols, M. D., Vienna.

ONONDAGA COUNTY.

H. E. Richardson, M. D., East Syracuse.
W. W. Bush, East Syracuse.
B. F. Chase, M. D., East Syracuse.
R. A. Whitney, M. D., Liverpool.
A. B. Rood, M. D., Minoa.
E. B. Merwin, M. D., Manlius.
S. E. Crane, M. D., Onondaga Valley.
C. E. McClary, M. D., Syracuse.

ONTARIO COUNTY.

O. J. Hallenbeck, M. D., Canandaigua.
L. P. Conley, M. D., Clifton Springs.
John H. Pratt, M. D., Manchester.
William A. Howe, M. D., Phelps.
D. S. Allen, M. D., Seneca.
D. A. Eiseline, M. D., Shortsville.

ORANGE COUNTY.

H. T. Kurtz, M. D., Highland Falls.
J. L. Hanmer, M. D., Middletown.
Z. K. Greene, Middletown.
Theodore Writer, Otisville.
W. N. Snyder, M. D., Newburgh.
L. A. Harris, M. D., Newburgh.
Ira C. Whitehead, M. D., Walden.
A. C. Santee, M. D., Wallkill.

ORLEANS COUNTY.

H. M. Burritt, M. D., Kendall.
George F. Rogan, M. D., Medina.

OSWEGO COUNTY.

Joseph Pero, M. D., West Amboy.
D. E. Lake, M. D., Fulton.
F. D. Stone, M. D., Palermo.
Robert Simpson, Jr., M. D., Volney.
E. W. Crispell, M. D., Williamstown.

OTSEGO COUNTY.

J. H. Moon, M. D., Cooperstown.
C. H. Herrick, M. D., Gilbertsville.
G. E. Schoolcroft, M. D., Hartwick.
W. J. Whitford, M. D., Schenevus.
O. W. Peck, M. D. Oneonta.
H. A. Ward, M. D., Richfield Springs.
H. G. Willse, M. D., Richfield Springs.
J. W. Swanson, M. D., Springfield Center.
J. J. Sweet, M. D., Unadilla.
D. H. Davis, M. D., East Worcester.

RENSSELAER COUNTY.

C. D. Welch, M. D., Castleton.
William L. Clark, M. D., Hoosick.
M. B. Hutton, M. D., Valley Falls.
E. E. Reichard, M. D., Averill Park.
G. R. Little, M. D., Schaghticoke.
W. D. Walradt, M. D., Castleton.
C. E. Nichols, M. D., Troy.
M. D. Dickinson, M. D., Troy.
M. B. Hutton, M. D., Valley Falls.

ROCKLAND COUNTY.

A. O. Bogert, M. D., Nanuet.
F. E. Pagett, M. D., Spring Valley.

ST. LAWRENCE COUNTY.

W. H. Mulholland, M. D., Heuvelton.
F. H. Ladd, M. D., Crary Mills.

SARATOGA COUNTY.

F. W. St. John, M. D., Charlton.
William Van Doren, M. D., Mechanicville.
T. E. Bullard, M. D., Schuylerville.
D. C. Moriarta, M. D., Saratoga Springs.
W. B. Webster, M. D., Schuylerville.
M. M. Dolan, M. D., South Glens Falls.
Charles S. Prest, M. D., Waterford.